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Shop Kinks.

No. 27.

By L. F. LYNE.

A TALK ON TOOL POSTS.

Almost all the known rules for change gears, for screw cutting upon lathes, were published during the past year in the AMERICAN MACHINIST, and if any apprentice or young mechanic lacks correct knowledge in this direction, it is because he has neglected to try those rules in practice and select the best for his note-book. Every mechanic, I must say, ought to keep a note-book, and if he records but one valuable item each week, in a few years he will have a book which will be of more practical value than any one to be had in book stores. Little has been done by way of improving tool posts, while almost all other parts of the lathe have undergone more or less modification and improvement.

The tool post and slide, as used upon the carriages of ordinary lathes, is shown in Fig. 1, where *A* represents the slide, *B* the tool post, and *E* a collar having one thick and one thin side, for the purpose of elevating or depressing the point of the tool. This style of tool post, although it has been in general use a great many years, is open to serious objections. First, the tool is very insecurely and imperfectly held; second, its capacity for elevating and depressing the tool is very limited; and finally, the whole arrangement

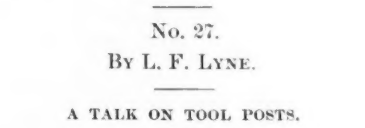


Fig.8.

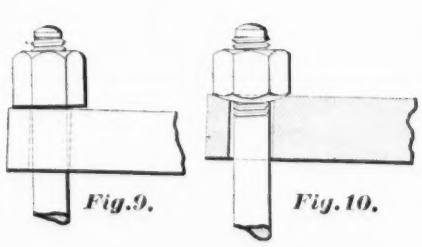


Fig.9. *Fig.10.*

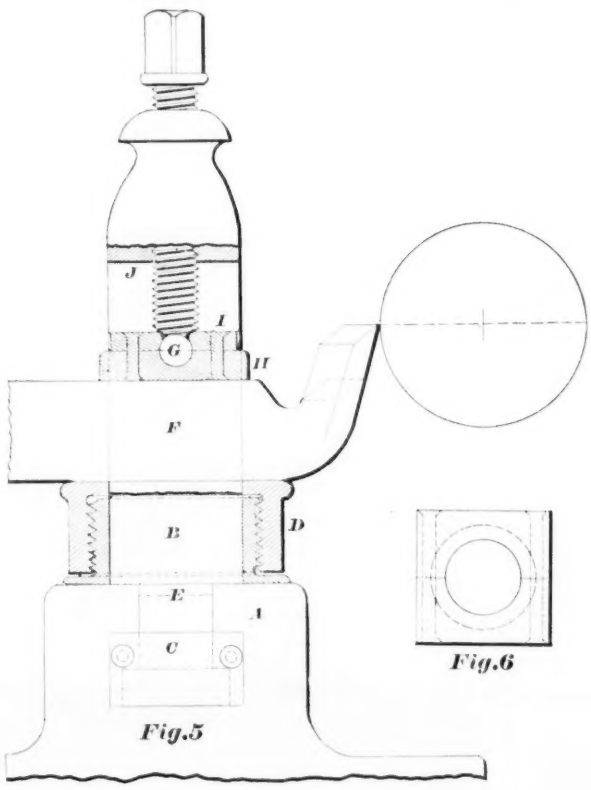


Fig.5.

Fig.6

Fig.3.

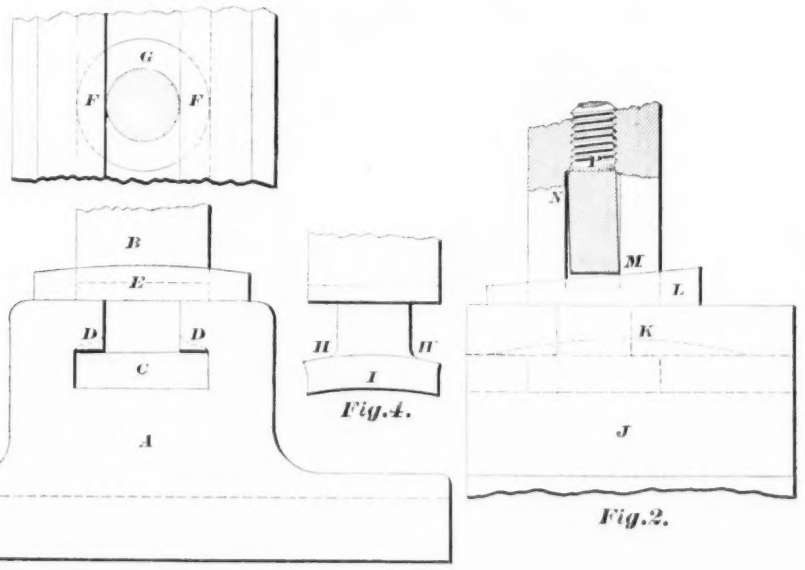


Fig.4.

Fig.2.

Fig.1.

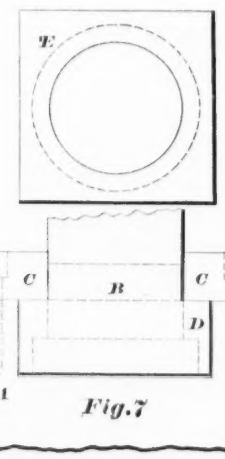


Fig.7

gets out of repair very soon with a very damaging effect upon the disposition of the workman. I will endeavor to prove my assertion: When a lathe is new the slide *A* is generally made of solid cast-iron. The collar *C*, at the bottom of the tool post is made to fit neatly through the T-shaped groove in the slide. By observing Fig. 3 it will be seen that all the strain brought upon the tool post by tightening the set-screw is at the two opposite sides, upon the wearing surfaces *F F* of the collar *G*.

If we desire to set the tool level, the wedge-shaped collar will be placed as shown in Fig. 2, with the thick side at *L*, *J* representing an end view of slide. This brings the bearing upon one corner of the tool at *M*, causing it to tip at the top, as shown at *N*. It will not be doubted that with such an unstable support for the tool an excessive pressure upon the set screw is required to hold the tool in taking a heavy cut. This is well recognized by the workman, who screws up as tightly as he dares without breaking the set screw.

The strain being at opposite sides, instead of at the center of the tool, the tool post tips, and when the next tool is put in place, the thick side of the collar *L* will probably be placed at the other side, which would tip the tool post in the opposite direction to the first. The result of repeating these operations is to strain the collar *I* at the bottom of the tool post, as shown at *H H*, in Fig. 4. This collar very soon becomes jammed in the groove in the slide, and has to be removed with a hammer, in order to grind off the lower corners. The cast iron is also rapidly worn away, as shown at *D D*, Fig. 1, and at *K*, in Fig. 2.

By long use I have found it impossible to get the tool post through the ends of the groove without first chipping away the shoulders formed there by the excessive and repeated straining of the tool post. The set screw for holding the tool may be of the best steel and tempered, yet, if it is too hard, it will break, or, as is generally the case, the end will be split and spread out, as shown at *P*, Fig. 2. Unless this is continually watched, the end will soon be upset sufficiently to prevent the screw from being withdrawn from the hole.

Having pointed out a fact which has been known to be true by every lathe hand who has operated a lathe fitted up in this way, I will now show how these troubles may be overcome. First: We should have more bearing for the collar, in order to stop the wear in the groove. This I have accomplished by making a collar of two flat pieces of steel riveted together, as shown in Fig. 6. This is to be bored out to fit the bottom of the tool post *B*, as shown at *C*, in Fig. 5. The joint between these plates should be placed at right angles to, and not parallel with, the groove, as it is much more stiff and durable. I contend that a lathe-cutting tool should always be placed exactly at right angles to the tool post, and bear upon a flat surface, in order that it may be held as firmly, and with as little pressure as possible.

As a rule, the "go-and-come" upon the tool posts of ordinary lathes is insufficient to allow the tools to be used to advantage when worn. They have to be "shimmed" up, which necessitates having a box of bits of iron of different thicknesses upon the lathe for this purpose, for use, both above and below the tool. For elevating and depressing a tool, I like the device shown in Fig. 5.

A similar device has been used upon some lathes for several years, but it is not made precisely like this.

My device consists of two hardened steel collars joined together by a thread. The lower collar has a projection at *E*, which slides in the groove of the rest and prevents the collar from turning. The upper collar *D* has a milled edge, and is placed as shown, in order to exclude chips. The lower collar should fit the tool post loosely, so that any chips that pass the top edge will drop down without being caught in the thread. These collars are made much deeper than those upon any lathes I have ever seen, in order that the cutting edge of the tool *F* may be worn and ground away to the dotted line, and yet allow enough thread upon the collars to avoid any possibility of injury to them by running them too far out in use.

The tool-slot *J*, in the tool post, necessarily has to be made longer than usual, to allow the body of the tool to be raised as the cutting edge is worn away.

To protect the point of the set-screw and prevent it from "crawling," in tightening and throwing the tool out of position, I turn a ball, *G*, upon the point and fit a hardened steel shoe, *H*, to it, as shown. When the set-screw is loosened this shoe is prevented from dropping off by the plate *I*, held by two rivets.

If the ends of the set-screws upon the tool posts of ordinary lathes were rounded off and a shoe slipped in upon the top of the tool, it would be far preferable to the usual flat point. A drop of oil is of course required occasion-

ally, to prevent the parts from cutting. The design of tool post shown in Figs. 5 and 6 is intended for application to lathes, by simply making a new tool post and cutting the T groove in the slide deeper. But it pays to make a new slide, as shown in Fig. 7. The style shown in Figs. 5 and 6 is stiff enough for all ordinary work, but for very particular and heavy work it is better to have the groove wider, and the plates *D* and *E* upon the bottom of the tool post in one piece. This may be done by turning the tool post *B* straight and slipping the plate over it. In using these plates, the diameter of the collar upon the bottom of the tool post may be made smaller, as the bearing is so much increased by the plate.

In repairing old lathes, and where it is thought best upon new work, it is a good plan to plane off the top of the slide *A*, and attach two hardened steel plates *C C*, by means of screws as shown, which, when completed, makes an exceedingly durable tool post. Plenty of room should be allowed between the bottom and sides of groove and the edges of plate so that there is no possibility of the tool post being stuck by chips.

Another peculiar shaped tool post is that shown in Fig. 8. The projections, *B B*, are generally of cast iron, cast solid with the slide *A*. They wear away in the same manner as described in reference to Figs. 1 and 2, and when so worn they should be cut out entirely, dovetailed grooves planed as shown, and the hardened steel strips *B B* driven in.

A depth of $\frac{3}{16}$ inch is sufficient for the dovetail. I prefer, however, to repair such slides by planing down the top and using the method shown in Fig. 7. Large lathes, planers, shaping and slotting machines, have either two or four studs or bolts with cross bars for holding the tools. It requires very good judgment in tightening the nuts upon these studs, to prevent any tendency on the part of the nut to bend or break the stud. This will be readily understood by an inspection of Fig. 9, where it will be seen that the nut being faced square and bearing only upon one edge there is great danger of breaking the stud when the former is tightened. When the tool is changed it is generally the case that the other side will be the higher, which will bring the strain in the opposite direction.

At one time in a shop where I was engaged, studs and bolts upon the different machines were continually breaking from the causes mentioned.

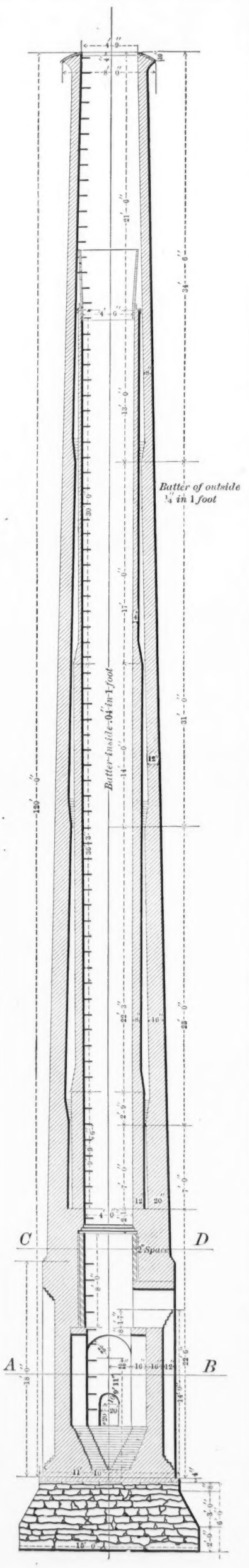
I had the cross bars all taken off and reamed as shown in Fig. 10, then the nuts were rounded to make a ball joint which would allow considerable angularity of the bars without interfering with a direct pull upon the stud or bolt. After this plan was adopted not a bolt or stud was broken. Some advocate the plan of putting on a washer (having one plane side for the nut and a rounding side to make the ball joint), but it is wholly unnecessary, as rounding the face of the nut answers all purposes.

It is a good thing on all large bolts to bore a hole through the center and put a blind plug in the end that comes in sight. This renders the bolts a great deal stronger, as they begin to break at the center first.

I will give one practical illustration: I was once engaged in a shop where there was a helve or trip hammer. The two bolts which held the top die were $1\frac{1}{2}$″ in diameter. These bolts were constantly breaking and being replaced by new ones. One day I had a pair of new bolts made and drilled a $\frac{1}{2}$″ hole through the center from end to end. Those bolts lasted for years and for aught I know are in use yet.

The devices here described are free to be used by any one, so far as I know.

The *Sioux City* (Iowa) *Journal* tells of the discovery of an inflammable shale mine in Mix County which bids fair to yield important results. The shaft was sunk in search of coal, and the burning quality of the shale was discovered by a piece thrown out by a blast falling into a fire. Experiments are now being made with it under steam boilers. The inflammable property of the shale comes from coal oil.



Construction of a Brick Chimney.

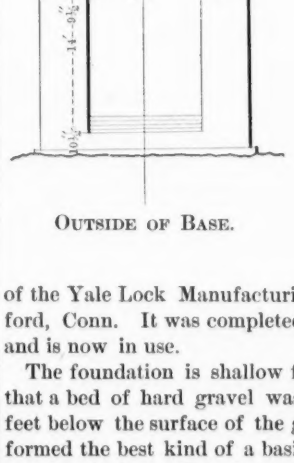
Practical information in reference to the proportions of chimneys is very limited.

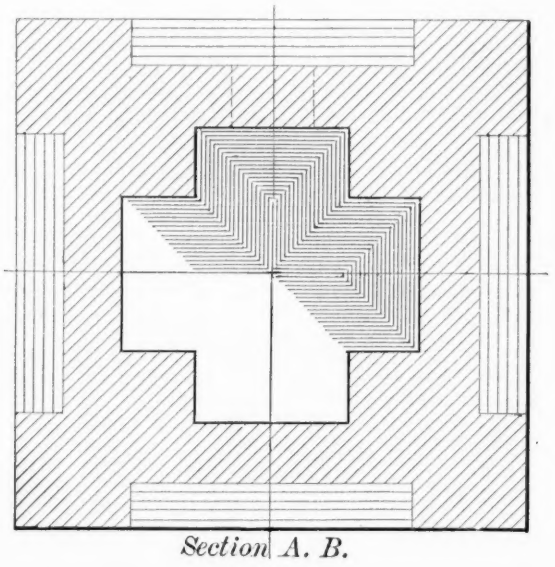
Most of those already in use are entirely too small to meet their requirements.

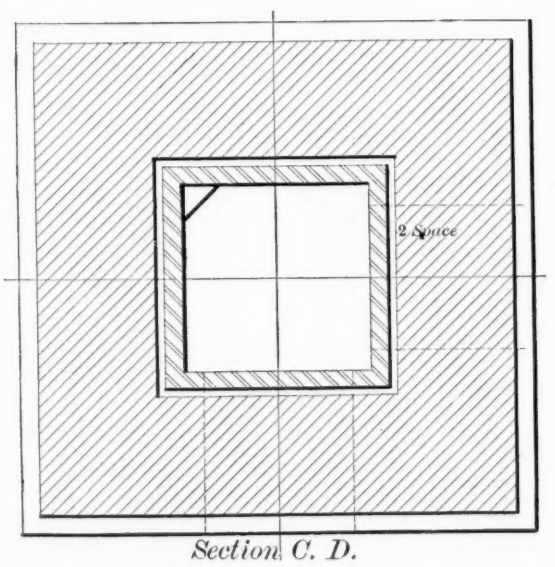
Especially is this true in large cities where room is so valuable, and the owner of the property assumes the right to know all about chimneys, and when the boilers and engine are selected and located he dictates the size of the chimney and insists that his plan will give sufficient capacity for all practical purposes.

When the boilers are ready to be fired up it is found that the draft is not there, and after a discussion of remedies a steam blast nozzle is selected as the cheapest and most economical.

We do not remember of a single instance of an error being made by getting the chimney too large. We have the pleasure this week of presenting cuts on this page of a very fine specimen of a chimney. This chimney was designed by Henry R. Towne, President of the Yale Lock Manufacturing Co., Stamford, Conn. It was completed last summer and is now in use.







The foundation is shallow for the reason that a bed of hard gravel was struck a few feet below the surface of the ground, which formed the best kind of a basis for a chimney foundation. The first course of stone was composed of large selected flat boulders, 4 ft. +4 ft., upon top of which were placed other smaller ones laid in Portland cement. The upper part was built of small stones grouted with cement, with a stone water table at the top. It will be observed from the engravings that the base of the chimney is so constructed that the weight is equally distributed over the top of the foundation, instead of building the inside walls straight as in ordinary chimneys, which throws the weight upon the outer edges of the foundation. The chimney was built with a double wall, having an air space between. The top of the outside wall is surmounted by a heavy casting in four pieces, bolted together at the corners and laid upon a bed of mortar. The inside wall has a sheet iron, No. 18 W. G., hopper top, which covers the sharp offset which would otherwise occur to affect the draft. The reader will see from the drawings that the walls are inclined from the outside inward and from the inside outward. The inside walls are so proportioned that they afford a free escape for the products of combustion as they expand in their progress upward. The walls are built independent of each other, with no connection whatever, so that each may expand and contract without affecting the other in the least. Tie irons, consisting of pieces of flat hoop iron, with each end bent downwards, were built into the walls all the way up, at distances of three feet apart. The inside walls also had tie irons up to the termination of the eight-inch wall. An inside ladder extends from the bottom to the top, and is formed by building in short bars of round iron $\frac{3}{4}$ inch in diameter. An iron ladder is suspended from one of these bars to reach over the sheet-iron top of the inner wall. There is a wall of firebrick, 8 feet high, on the inside of chimney, where the flue enters. This wall was put up after the chimney was completed, and may be replaced at any time without disturbing the outer wall. When completed, this chimney, which is 120 feet high, had an excellent draught before the application of any heat whatever.

It was built to run six horizontal tubular boilers, 54″ in diameter and 15 feet long. Each boiler has 54 tubes, 3″ in diameter, with a grate 4 feet long and 4 feet 6″ wide, and is rated at 65 horse power. The opening from each boiler to flue is 13″×33″, while the main sheet-iron flue is 36″ in diameter.

These boilers, in addition to furnishing steam to drive a 20″×42″ stationary engine of the Corliss type, have to supply steam for heating extensive buildings and for other purposes. The chimney here described has been calculated amply large for meeting all demands that are likely to be made on it. Dimensions and other particulars may be readily obtained from the engravings.

We append the specification for this excellent piece of work:

CONTRACT AND SPECIFICATION FOR BRICK CHIMNEY STACK FOR THE YALE LOCK MANUFACTURING COMPANY, STAMFORD, CONN.

1. FOUNDATION.—That the said company will have built and finished, ready for the brick work, a proper stone foundation, and will assume all responsibility therefor.

2. BRICKS.—That said company will furnish, delivered on the ground, as the contractor may require them, all bricks required in the construction of the chimney, and that the contractor will carefully select bricks of good and uniform color for the external faces of the chimney.

3. MATERIALS.—That the contractor will furnish all other materials required, including lime and sand, all of which shall be of thoroughly good quality of their respective kinds, special care being exercised to secure a strong and durable mortar.

4. BRICK-WORK.—That all portions of the chimney shall be built in strict accordance with the plans and sections shown on the drawings attached hereto. The bricks for outside faces of walls to be selected as specified above, and no swelled, rotten or unsound brick to be used in any part of the structure. All bricks to be well wetted before laying, and to be laid with flushed solid joints, leaving no empty spaces in the walls, except where called for on the plans. All courses to be run perfectly level and straight, and, where the walls are of sufficient thickness, every sixth course to be tied and worked in regular bond, both on the outside as well as on the inside faces of walls. The batter of outside walls to be exactly one-fourth inch to the foot, and the greatest care to be taken that a uniform batter is preserved on each of the four faces, so that the chimney, when completed, shall be exactly perpendicular. Special pains must also be taken to carry each of the outside angles exactly vertical, and to avoid giving them any "twist." The joints of the exterior walls of the chimney and of the interior walls of the vertical flue (that is, those with which the smoke will come in contact) to be filled fully flush with faces of bricks when struck with the trowel, and every joint, both horizontal and vertical, to be neatly and carefully rubbed smooth with a "jointer," so as to leave the faces of the walls perfectly smooth and flush.

5. BONDING IRONS.—That the company will furnish proper bonding strips of hoop iron, cut to lengths required, and that the contractor will lay these strips in both the inner and outer walls of the chimney, at vertical intervals of about three feet, as may be directed by the company, the ends of each bonding iron being bent so as to engage with the brick-work and assist in tying it firmly together.

6. LADDER.—That the company will furnish, and the contractor build in place, in one corner of the inside flue, iron bars, to constitute a steps or ladder for gaining access to the top of the chimney. These bars to be placed diagonally across one of the corners, and at vertical intervals of about 18 inches apart.

7. OPENINGS.—That the contractor will set and build into the chimney, as shown on the drawing, an iron cleaning door (to be furnished by the company) and will also construct two circular flue openings of the form and position shown by the drawing.

8. CAPS.—That the company will furnish, delivered on the ground, a cast iron cap or funnel, to be placed on the top of the inside lining or flue, as shown by the drawing, and also cast iron cap, in four pieces, (complete with joint plates) to form the final finish on top of chimney, the contractor to raise these caps and carefully set them in their proper positions.

9. FIRE BRICKS.—That the contractor will construct a fire brick lining (the joints to be carefully laid with fire clay) near the base of chimney, as shown on the drawings. This fire brick lining to be laid independently of the surrounding walls, so that it shall not carry any part of the weight of the chimney, and so that it may be removed and renewed without disturbing the surrounding walls. The fire bricks and clay to be furnished by the company.

10. GENERAL.—That the contractor will provide all necessary scaffolding, and will remove the same upon completion of the contract; that the company will make provision whereby the contractor can obtain a supply of water by a line of hose (to be furnished by the contractor) not exceeding 100 feet in length; that the contractor will exercise constant supervision of the work while in progress, and will, to the best of his ability, construct and complete the work in a thorough and workmanlike manner throughout, it being the intention of this contract to secure the construction of said chimney in as perfect a manner as possible.

The contract price was $1,250.

A large part of machine shop economy consists in keeping cutting tools sharp and in good working condition.

Academy Days of A. L. Holley.

Editor American Machinist:

The universal sorrow in the inventive and mechanical world over the recent decease of A. L. Holley, prompts me to jot down a few particulars of his earlier school experiences, which go to prove the truth of the proverb, "The boy is father of the man."

Mr. Holley entered Williams Academy at Stockbridge, Mass., in the fall of 1848, then under my charge. He is still remembered as a fair, fresh-cheeked, blue-eyed, wide-awake boy of 16, who pursued studies preparatory to a college course. His geniality, generosity and overflowing good humor made him popular with his schoolmates, and soon gave him the lead both in and out of school. He excelled in every branch of study; but his chief interest centered in Natural Philosophy and Mechanics. He was a prominent member of a literary society of the institution, called the "Philologian," in which he manifested talent unusual for his years for debate and free discussion; while his fun-loving propensities found vent in conducting mock trials and in humorous essays and declamations. He established and mainly conducted a periodical entitled *The Gun Cotton*, issued fortnightly on a large sheet in manuscript, which was read by myself from the desk, and afforded great interest and amusement by the variety and spice of its contents. This he edited during his stay at the Academy.

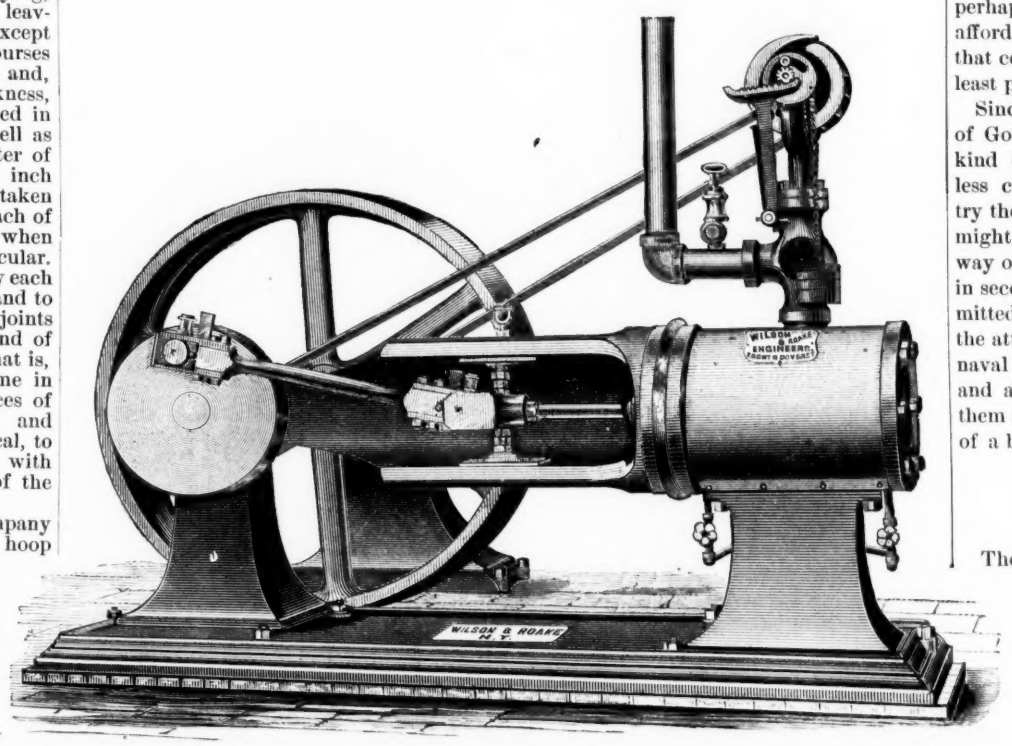
Though excelling in all the branches of study required of him, his *penchant* for mechanics and invention developed itself markedly when he attacked Natural Philosophy and Physics. Dissatisfied with the meager description in the text-books of the steam engine, with which he seemed to be better acquainted than the author of the treatise, he at my request made drawings in detail of a stationary engine and of a locomotive, with an accuracy and skill that would have done credit to a professional engineer or draftsman. These I used in demonstration in preference to the imperfect model among the school apparatus. During one of his vacations, he came up from his Salisbury home expressly to show me a miniature engine of his own building. It was complete in all respects and of skillful workmanship; and, on being fired up, ran with admirable success. Thus he foreshadowed the devotion to the mechanic arts which so eminently characterized his manhood. One number of his *Gun Cotton*, I remember, was devoted to the description of an aerial voyage made by a machine of his own devising, whose practical workings were related with as much interest as the details of the wonders of sight-seeing it enabled its inventor to describe. This, he prophesied, would be substantially the vehicle of locomotion in A. D., 1950.

His temperament prompted him to constant activity. There was not a lazy bone or muscle in his body. In fact, his mind was too powerful for his physique; and beyond doubt, the continued high-pressure at which he drove his mental enginery, during all his busy life, materially shortened his days.

In his reading he was fond—though by no means exclusively so—of works of imagination. Every new invention that fell under his eye received due notice in his *Gun Cotton*. Imaginative works seemed to be the whetstone on which he sharpened his own inventive genius. It is rare that good sense and sound judgment succeed in subduing the *imagination* to become the servant of the *practical*, to the extent realized in the case of Mr. Holley.

Your brief but comprehensive article in the AMERICAN MACHINIST of 18th February, follows the career of Mr. Holley subsequently to his college life. Doffing the student's toga for the workman's blouse, he put to the test the best theories of his book-learning, and showed the world, to its immense benefit, the unusual example of a man possessing the combination of enlarged education, inventive talent and practical common sense.

Stockbridge, Mass. E. W. B. CANNING.



NEW ELECTRIC LIGHT ENGINE.

Naval Construction.

It is a question worth considering, whether with the experience of the Nations of the world in the matter of constructing navies, it would not be good policy for them to combine in guaranteeing neutral ground upon which a half dozen—more or less—enterprising firms could establish themselves in the business of manufacturing such commodities. It can hardly be denied that Governments manage to make tolerable failures when they take up this branch of business, but there is a possibility that individuals having less business in a general direction, might, by giving more attention in a special direction make it successful. A half dozen firms in spirited competition would have an interest in improving their wares, and their International advertising sheets would be of value as showing just what could be had for the money. This, in the present state of the art, and according to present processes, is a matter of entire uncertainty. For instance, the United States just now proposes to do something in this line, but no one in the world can tell anything about the ultimate result of their efforts. That is as to whether the cost will be ten or fifty million dollars; whether the speed will be five or fifteen knots; how much "hammering" they will stand, or whether it will be safe to get to sea at all with them. These are, perhaps, matters of little importance, but at the same time the knowledge would be of interest—to the curious at least.

If this business was attended to by those strictly in that line, all this uncertainty would be changed to certainty. Navies would be bought and sold like anything else—under a guarantee as to performance and in quality to suit the purchasers. They could be kept in stock, like ready-made wearing apparel, warranted to fit, or they could be made to measure (of the purse) of the contracting parties. In the present temper of the times business would be brisk and deliveries would have to be prompt. When a country starts out to make their own outfit there isn't much probability of its being of any particular use when completed. It gets the ideas of too many individuals engrafted on it before completion, and it takes so much time to do all this that it usually stands out as a fair example of things twenty-five years previous.

On the whole, the ready-made plan would perhaps, be the most satisfactory. It would afford an opportunity to meet emergencies, that could be accurately measured, with the least possible expenditure of means.

Since there isn't the remotest probability of Government officials doing a job of this kind on business principles, why not give less cumbersome bodies an opportunity to try their hand in the manner suggested? It might be necessary to offer something in the way of compensation to enterprising dealers in second-hand material, who it must be admitted in the end, do a thriving business off the attempt to construct iron clads and other naval monsters, but it might be vastly cheaper and altogether more satisfactory to pension them off and get at the matter in some sort of a business way.

New High Speed Engine.

The accompanying engraving represents an engine made particularly for use in electric lighting, by Wilson & Roake, Front and Dover streets, New York. This engine was designed from a knowledge of the requirements of a motor for this purpose, and with the intention of providing one that should be economical in the use of steam, govern very closely, and at the same time be simple in its parts and not liable to get out of order in operation. The design is that of a compact, moderately high-speed engine.

One of the prominent features is the employment of a double-ported slide, which as compared with the single-ported slide valve admits and exhausts the steam much more readily, and hence makes it practicable to run at higher speed, and at the same time admit a sufficient supply of steam to keep up a high mean pressure in proportion to the boiler pressure, and to exhaust the steam without the detrimental back pressure incident to the single port. This valve also permits an earlier cut-off, and hence a more economical use of steam than is practicable with the single-ported valve, it being a well known fact that with the latter an early cut-off is attended with a prejudicial back pressure and compression, and early release, the effect of which is to neutralize the gain from expansion.

The engine is carefully balanced, and the speed is controlled by a governor which admits of adjusting the speed while running. The piston is fitted with steam-set packing, which requires no attention and will not cut the cylinder, and the piston rod and valve stem are provided with metallic packing, thus insuring evenness of wear and exemption from the annoying delays of repacking.

The bearing surfaces are of ample proportions, and we are informed that all parts of the engine are made accurately to gauge, and with the skill and care so essential in an engine of this class.

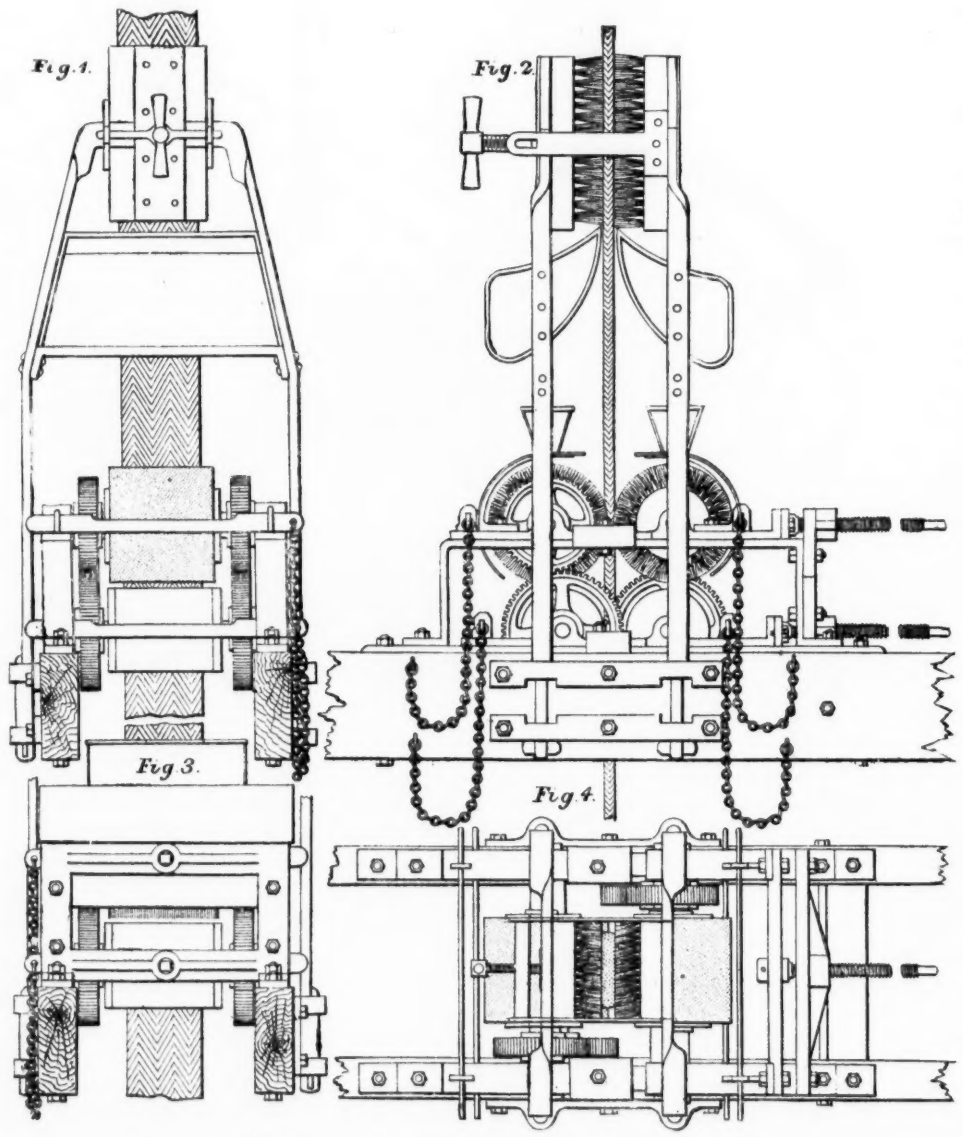
The best way to enlarge a shaft, when the bearing is close to the end, is to drill a hole in the end of the shaft about one-third as large as the shaft, fill the hole with lard oil to within half an inch of the end, then plug it tight with a steel plug. Heat it slowly until it gets red hot—then let it cool slowly, then dress the bearing down to fit.—*Sewing Machine News.*

Wire Rope Cleaning and Lubricating Machine.

The engraving on this page, for which we are indebted to *Engineering*, represents a machine for cleaning and lubricating wire rope, designed by Parrington & Almond, and constructed by A. A. Rickaby, Sunderland, England. Our contemporary says it has been employed for some time past with very satisfactory results, and thus describes it:

"The machine is applicable to either flat or round ropes, and in our engravings it is shown as arranged for the former kind.

"Referring to our illustrations it will be seen the rope passes first between a pair of flat wire brushes, the pressure of which on the rope can be adjusted by the screw shown, while below these brushes are placed two hoppers for catching the dirt removed. Lower down the rope passes between a pair of revolving brushes, and then between a pair of rollers of soft material, which grip it with an adjustable pressure. These rollers are geared to the revolving brushes as shown, and they thus drive these brushes so that their surfaces move in a contrary direction to the rope. For cleaning the rope revolving wire brushes are used, and these as they rotate penetrate between the strands of the rope and leave the latter clean for receiving the lubricant. When oil or grease is to be applied the rotating wire brushes are replaced by strong hair brushes, which are fed with lubricant from the feeders above, this lubricant being thoroughly brushed into the outer strands of the rope. The changing of the revolving brushes can be effected very readily, and it will be noticed that the brushes act equally well whether the rope is running up or down. It is claimed for the machine we have described that from the thorough manner in which the ropes are cleaned their condition can be more readily and accurately determined by inspection, while from the systematic manner in which the lubricant is applied there is a great reduction of waste and a better quality of lubricant can be profitably used.



WIRE ROPE CLEANING AND LUBRICATING MACHINE.

Locomotive Engine Running.

BY ANGUS SINCLAIR, IN THE *Railway Age*.

PRIMING.

Leaky flues or stay bolts may sometimes be dried up temporarily by putting bran or any other substance containing starch in the feed water. Care must be taken not to use this remedy too liberally or it will cause foaming. It is, however, a sort of granger resort, and is seldom tried except to help an engine to the nearest point where caulking can be done.

No engine steams so freely but what it will get short under mismanagement. The locomotive is designed to generate steam from water kept at nearly a uniform temperature. If an engine is pulling a train which requires the evaporation of 1,500 gallons of water each hour, there will be 25 gallons pumped into the boiler every minute When this goes on regularly all goes well; but if the runner shuts the feed for five minutes and then opens it to allow 50 gallons a minute to pass through the pump the best engine going will show signs of distress. Where this fluctuating style of feeding is indulged in, and many careless runners are habitually guilty of such practices, no locomotive can retain the reputation of doing its work economically

SHORT OF WATER.

Deficiency of steam with a locomotive that is expected to get a train along on time, is a very trying condition for an engineer to endure. But a more trying and more dangerous ordeal is want of water. Where steam is employed as a means of applying power, water must be kept constantly over the heating surfaces while the fire is incandescent, or their destruction is inevitable. With a boiler which evaporates water so rapidly, and in such large quantities as that of the locomotive, the most perfect feeding apparatus is necessary. Nearly all locomotives are well supplied in this respect. Good pumps or efficient injectors provide the engineer with excellent appliances for feeding the boiler under ordinary circumstances. But conditions sometimes occur where the best of pumps or the most reliable of injectors fail to force water into the boiler. When such a case overtakes him, the engineer should resort to all known methods within his power to overcome the difficulty, by removing the obstacle that is preventing the feeding apparatus from operating. But while doing so the safety of his fire box and flues should not be overlooked for a moment. The utmost care must be taken to quench the fire before the water gets below the crown sheet. This can be performed most effectually by knocking the fire out, but sometimes the temporary increase of heat occasioned by the act of drawing the fire is undesirable; and in such a case the safest plan is to dampen the fire by throwing wet earth or water, saturated with fine coal, upon it. Or a more urgent case still may intervene, when drenching the fire with water is the only means of saving the sheets from destruction. This should be a last resort, however, for it is a very clumsy way of saving the fire box, and is liable to do no small amount of mischief. Cold water thrown upon hot steel sheets causes such sudden contraction that cracks, or even rupture, is likely to ensue.

As "burning his engine" is the greatest disgrace that can professionally befall an engineer, every man worthy of the name guards against the possibility of being caught short of water, unawares, by frequent testing of the gauge cocks. It is not enough to have a good working water glass. If an engineer is ambitious to avoid trouble, he runs by the gauge cocks, using the glass as an auxiliary. Careful experiments have demonstrated the fact that the water glass, working properly, is a more certain indication of the water level than gauge cocks; for when the water is dirty the water rises above its natural level and rushes at the open gauge cock. This can be proved when water is just below a gauge cock level. If the cock is opened slightly, steam alone passes out; but when the full opening is made water comes. But water will not come through a gauge cock unless the water level is in its proximity, and an engineer can tell, when his gauge shows a mixture of steam, that the water shown is not to be relied upon. It is not "solid." On the other hand, a water glass out of order sometimes shows a full head of water when the crown sheet is red hot.

THE TANK EMPTY.

The most natural cause for pumps or injectors ceasing to work is when there is no water in the tank. This condition comes round on the road occasionally where engineers neglect to fill up at water stations, or where there are long runs between points of water supply. When an engineer finds himself short of water, and the means of replenishing his tank too distant to reach, even with the empty engine, he should bank or smother the fire and retain sufficient water in the boiler to raise steam on when he has been assisted to the nearest water tank. This will save tedious delay especially where an engine has no pumps. Occasionally, from miscalculations or through accidents, the fire has to be quenched and insufficient water is left in the boiler to start a fire on safely. In this event buckets can be resorted to and the boiler filled at the safety valves, should there be no assistance or means of pumping up. Every possible means should be exhausted to get the engine in steam, before a runner requests to have his engine towed in cold.

STRAINERS.

When the top of a tank is in bad order and permits cinders and small pieces of coal to fall through rivet holes or through seams, the engineer may look out for grief with his pumps or injectors. On the first signs of the water failing, he should examine the strainers, and he will probably find that these copper perforations, which stand like wardens guarding the safety of the pumps, have accumulated a mass of cinders that obstructs the flow of the water.

PUMPS.

Mechanical prognostications seem to indicate that pumps as locomotive attachments have outgrown their usefulness, and that their days are numbered. Locomotive engineers are a proverbially conservative class, and this is perhaps the reason that the writer never knew of an engineer who did not prefer to have a pump left on his engine. Pumps have a good many faults and their defects have been industriously magnified, but they provide a very comfortable and reliable means of putting water into the boiler. If an engineer is in the habit of pumping regularly, and of watching his engine closely, he can tell immediately from the steam when the pump stops working. Then he will open the pet cock and its action will indicate to some extent where the trouble lies. If the pet cock throws a feeble stream of water the trouble probably is in the lower valve. If that sticks up or part of the bottom cage breaks, the plunger will push the water back into the feed pipe on the return stroke, consequently there will be no pressure to throw a strong stream through the pet cock. When the upper or pressure valve is damaged or is stuck up, the pet cock will throw a full stream during the inward stroke of the plunger, but on the outward stroke the plunger will draw the water out of the branch pipe and air will be sucked in at the open pet cock. When the check valve is damaged or stuck up, steam and water will blow back through the branch pipe when the pet cock is left open. If the steam thus escaping from the check valves heats the pump and valves to a high temperature, it will be prevented from working from several causes. The heat generates a low form of steam which fills up the space behind the plunger, therefore, no vacuum is formed to draw the water. Not infrequently the pump valves expand so much from the heat that they stick fast away from their seats. If the pump has stopped through the presence of impurities on either of the valves or cages, the engineer knows that he may remove the obstruction by steam pressure, so after letting the feed pipe fill with water he opens the heater cock and closes the foot cock letting the steam and water blow the pump. If he considers the obstruction to be in the strainer and has not time to stop and take it down, he blows steam from the heater through to the tank which gives temporary relief. If any of the pump valves are stuck up and cannot be got back to their seats by blowing water and steam through them, the engineer will take a soft hammer and tap the seats lightly with good prospects of remedying the defect. In case no improvement can be effected in that way, and there is no other feeding medium to rely upon, the engineer can take down the top or bottom chamber in a few minutes to remove any impurities that may be keeping the pump from working. He will then be likely to find a piece of packing that has passed through the pump, bushing, or some other foreign substance, jammed between the cage and the valve keeping the latter immovable. Or the trouble may be a broken valve or cage which will render the pump useless till repaired.

When a pump valve has much lift, it is very liable to pound itself or the cage so heavily that breakage occurs. The proper lift required for pump valves depends to some extent upon the diameter of the valves themselves, those of liberal thickness requiring less lift than a valve of narrow compass. The engine pulling our train has pump valves 2½ inches diameter; the pump plunger, being worked from the cross head, has a diameter of 2 inches. The bottom valve has 3-32 of an inch of lift, the middle valve has ⅛ of an inch of lift, and the check valve rises ¼ of an inch. These dimensions produce very satisfactory results for all speeds. The pump

performs its work with remarkable smoothness, is free from pounding or fluctuating, and gives no trouble about repairs. Engines employed on fast passenger service have their valve lifts 1-32 of an inch less than this one, and slow freight engines are regulated to rise 1-16 of an inch more than the dimensions given.

In order to insure the regular and satisfactory working of a pump, care should be taken to prevent leaks about the feed pipes or heater pipes, the packing should be kept in good order, and the chamber joints should be perfectly air tight. During the outward stroke of the plunger a vacuum should be produced inside the pump into which the water rushes. If this vacuum gets partly filled with air or vapor, the working of the pump will be unsatisfactory. Nothing is so liable to produce this undesirable condition as badly-packed glands or leaky joints. A poor pump can often be made to produce fair work by attention and care bestowed upon its attachment, and lack of care will soon render the best-constructed pump unreliable.

The pump has one arch enemy which comes off victor in every conflict. That is sand. The railway idiom, which uses the word sand to express courage, originated in the knowledge of how certainly and quickly a handful of sand would vanquish the best pump that mechanical skill might produce. The grit works its way among the packing, and tears and cuts the plunger out of shape; it insinuates itself up between the cages and valves, and holds the latter so fast that hard hammering is often needed to release the compact. Proper washing out of the tank, cleansing of feed pipes, and the use of water free from sand is the only sure remedy for this evil. Where an engineer is situated so that he must take water containing sand in suspension, partial relief will be obtained by giving the valves free side room in the cages; but an injector will be found much superior to a pump as a means of putting sand-contaminated water into a boiler.

When a pump begins to show distress from over pressure, which will be indicated by the breaking out of joints, the rejection of stuffing-box packing and the bursting of branch pipe, the orifice between the check and the boiler should be examined; for that aperture often becomes almost closed by the accumulation of lime salts.

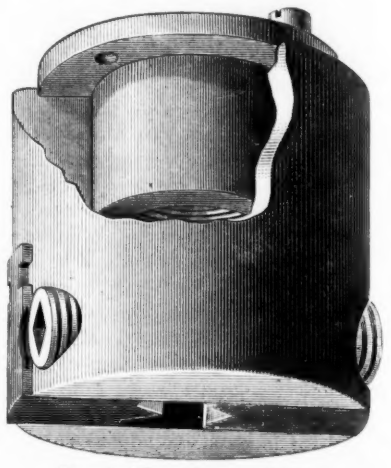
Where the feed pipes and other connections are perfectly air tight, some pumps will pound badly when the water is shut off. This can be prevented by making a minute hole in the feed pipe, or a more convenient place is the upper part of the heater pipe away above the water level.

Should the valves of a pump be leaky on their seats, the pump will not work satisfactorily. Where the lower valve is not properly ground on the seat, the plunger sucks air from the feed pipe or through the joints or packing, and at the return stroke compresses part of the air in the pump, and forces the remainder back into the feed pipe through the leaky valve. This process goes on after the feed is put on, the accumulated air stands like a cushion between the plunger and the water, and the pump will not go to work until the pet cock is opened, when the air rushes out, permitting the water to flow in. Engineers having pumps that will not work till the pet cock is opened, should have the suction valve ground in, and they will find a decided improvement from the operation.

One of our correspondents, in commending the plan for turning tapers in a lathe, as illustrated and explained by Geo. B. Foote in our issue of February 4, 1882, writes: "There is only one thing that works better, which is the Slate taper attachment." This attachment is undoubtedly the best thing devised for the purpose, since its use keeps the wear on the centers perfectly natural. We believe the patent has expired, and that it is free to any one who chooses to apply it. The arrangement of ball centers, advocated by Mr. Foote, was of course designed to meet cases where this attachment was not in use, and would be of undoubted advantage as compared with a plain taper center.

Improved Lathe Chuck.

The accompanying engraving represents an improved form of lathe chuck, made by Chas. H. Reid, Danbury, Conn. This chuck is very simple in the arrangement of its parts (which are few in number) and holds either flat or round drills, small material for turning, &c., as in making screws from long stock, or may be used for any of the purposes for which a small chuck is desirable; and especially where a strong grip is necessary. As will be seen it consists essentially of a cast iron body into which are fitted two steel jaws. One of these jaws has a V-shaped groove on its face, while the other is fashioned to a V-shaped projection corresponding with this groove. These are moved by the operation of a single screw turned by the means of a socket wrench. The angle of the groove in the jaw, as above referred to, is such that in combination with the different pitch of the ends of the screw which operate the two jaws, they are opened and closed at such respective velocities as to provide for any piece from the smallest to the largest which the chuck will take, being held exactly central.



REID'S NEW DRILL CHUCK.

Intead of threading the chuck to fit the lathe (as is commonly done) it is provided with a taper bush which is accurately fitted into a corresponding recess in the back of the chuck, this bush being threaded to the lathe spindle. It will be observed that this bush projects into the body of the chuck by which a long bearing surface is provided for keeping the two true, the one with the other; but what is of more importance still, by this means the overhang of the chuck beyond the end of the lathe spindle is not increased. An important object gained by the use of this bush is the practicability of using one chuck on several lathes in which the spindle screws are of different diameters or pitch; all that is necessary being to shift the bushes, of which as many as required may be provided at a trifling expense. In this way, if advisable, one chuck may be used on a half dozen different lathes, drill presses, &c. The jaws are made deep to provide a long clamping surface, and are arranged with a view to hold equally well the entire length of this surface.

Standard Steel Wrench.

Every machinist can look back to a good deal of valuable time wasted in looking for wrenches that were never the right size or shape when found A very common machine-shop practice is to make wrought iron or steel wrenches when wanted, which, being made in a hurry are of a make-shift character, notwithstanding which, the forging involves considerable time and expense, usually costing the time of one or two men who are waiting to use the tool, in addition to the time of the blacksmith and helper. This wrench, which never *fits* anything, gets altered over the next day to serve the purpose of some one else, and when wanted again for a purpose similar to that for which it was first made, there not being enough of it left to be brought to the shape required, a new one is forged—of course in the same hurry as before—and is without any especial value when done. It is not too much to say, that if the time that ought to appear in the "wrench account" of nine out of ten machine shops (but the most of which time appears against various jobs) was shown where it belongs, it would result in considerable astonishment.

The little engraving shown herewith is illustrative of an attempt to supply the want in this direction by C. W. LeCount of South Norwalk, Conn. It represents one of a series of standard steel wrenches, made with the jaws at an angle of 30°, milled to the various sizes of nuts and hardened. The design is to furnish a wrench that shall be strong enough for all purposes, and at the same time neat and correct in its proportions, and cheap as to cost. No attempt is made at finish other than the jaws.

They are also made with jaws unfinished to be fitted to size as required.

LETTERS FROM PRACTICAL MEN.

Preparing Work for the Lathe—Cutting off Tools and Center Reamers.

Editor American Machinist:

The letters which I have written, and which I may hereafter write, to your highly valued journal, are not intended for those mechanics who may already know of what I write; nor will I pretend to say that the methods which I point out are the best which have been or can be devised.

Believing that many of your subscribers are apprentices, or amateurs, who would gladly learn, and who take your paper for that purpose, I offer my communications with the hope that they may be of interest, and of some assistance to them. If, however, some of the "old chips" should find in them some new *hint, kink, or wrinkle,* they are welcome to it, if they think it good.

I will now say something about preparing work which has to be turned in the lathe, between centers.

When you only have a few pieces of the same kind to turn, first center the pieces with a center punch, so that when hung between centers they will run true at the end, and drill the centers. Then revolve rapidly on the centers, mark the high places and straighten. After straightening, countersink.

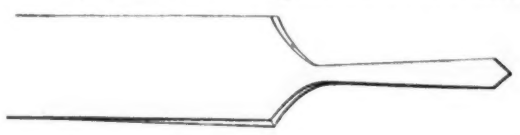
The centers should be drilled deep enough so that after countersinking and squaring up to the right length, enough of the drill-hole will be left to hold sufficient oil to lubricate the centers. Countersink the centers with a half round reamer (hereinafter described) to a sufficient depth so that after squaring up, a good bearing will be left. After the piece is so prepared square up both ends clear to center. Don't leave any burr or tit. This is easily done by slacking up the dead center after running the siding tool down as close as possible to the lathe center, and following up the slack of the center with the tool. In this way the piece will ride over on the tool and take off the burr, leaving a clean, nice end. On steel use oil; on wrought iron use a little spittle, soap suds, or soda water.

The size of the center drill, and depth of countersink, is a matter for the exercise of judgment. A $\frac{1}{16}$" drill hole countersunk, $\frac{1}{8}$" would be too small for a 6" shaft, and too large for a $\frac{3}{16}$" piece. The centers should be neat, and of appropriate size, neither too large nor too small; experience is the only teacher in this respect.

By looking at the end of the shaft, arbor, or other turned work, I can usually tell whether it was made by a first-class workman or not.

Under *no circumstances* should a piece be turned in a lathe, no matter how *little*, until it has been properly centered. Even when a piece is an inch or two too long, and has to be cut off in the lathe, the end should be properly centered, and squared up—at least around the center.

Speaking of cutting off ends, I will now tell now I make a cutting-off or parting tool. I grind the end to a point like a screw tool,



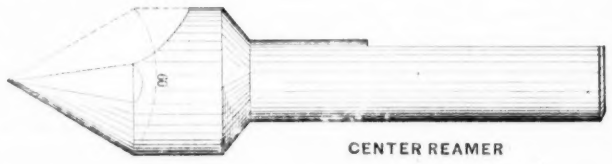
as shown in the following sketch, which is a top view.

I believe this tool will be found to cut off, or part, closer to center, will cut with less friction, be less liable to catch and less (in fact not at all) liable to run to one side, than the ordinary square point. Another great advantage is that you can cut off the piece at once, to the right length; the form of the cut being such that, when the pieces are broken apart there is no danger of breaking into the end of the shaft, in such a way that a good center cannot be made without making the piece too short. In cutting off steel, use oil to lubricate the point. The two chips rolling out leave a parting between them so that oil may get to the point when it is needed. For wrought iron, use either oil or strong soap suds. Try this form of tool and I believe you will never use any other for the purpose.

Another time I will give a method of centering when there are many pieces of the same kind.

The half round center reamer, which I mentioned I believe to be the best for use. Some mechanics use a fluted, and some a square center, for the purpose. I believe the reason for this to be that they do not know how to properly make a half-round one. Some who use a square center, give as an excuse, that they are easily ground, and that their use hardens the metal so that the centers wear better. I for one do not believe this.

The sketch shows the form in which to make center reamers. First turn the shank



CENTER REAMER

so as to fit the drill collet, or chuck; then turn off the point like a center to a gauge of the angle of 60°. Flatten one side from the point back to heel, not quite $\frac{1}{2}$ the diameter. Flatten from the cutting edge back for cut and clearance in the manner shown in sketch.

If you have never used this tool it will pay you to try it.

Helena, Montana. GEO. B. FOOTE.

Hoisting Nomenclature.

Editor American Machinist:

How to give orders in running a crane or other hoisting machine may seem too trivial for mention here. It is, however, one of those trifles which, well or ill done, go to make up the sum of good or bad shop practice. It is, indeed, of more importance than many other kindred matters, because, a confused or indistinct order regarding the movement of heavy bodies suspended in the air may lead to serious accident to person or property.

Every hoisting machine for heavy weights should have a placard fastened upon it containing an inscription stating who is responsible for keeping it in order and what persons are allowed to run it. This placard should give also a *code* by which orders must be given to the operator (whether it run by hand or power) by the person in charge of hoisting. It should also give instructions that all words are to be spoken in a loud, clear voice—clean cut and sharp.

The following short words, each one expresses a distinct order; and the seven cover the handling of any ordinary crane with a traveling car. For a plain "hoist," it is obvious that but three of them are required. They are: Up! Down! In! Out! Right! Left! Stop! In case so little is wanted that

the "stop" order cannot soon enough follow, the word "little" may be prefixed, as "Little down!" etc. Probably a better way, where a delicate motion is required, is to state the *amount*, as: "Down one inch," "Up three inches," etc.

The parallel columns below illustrate the way this work is usually done and the way it ought to be:

OLD VERSION.	REVISED VERSION.
Hyst her *away* there.	Up!
There now, Jim, that'll do.	Stop!
Let 'er go over yonder a little.	Left!
Now, drop on it a little.	Down!
Hold up there! Stop her!! *Quick!!!*	Stop!
Leetle eout, toward that end there.	Out!
That 'll do, Eleazar, me boy.	Stop!
Swing her 'round there, this way a *leetle*—jest a *teeny* bit.	Right, one inch!
Now, Billy, I want that 'ere thing up higher, just 'xactly three inches, so it'll go over that bed-plate.	Up, three inches!
There, Billy, tell your uncle that's enough.	Stop!
Let her jibe.	Down!
Pull her in now, towards you, like that.	In!
Higher, now.	Up!
Blame you, *whoa-a-a* there!	Stop!
Lower away.	Down!
Hi!	Stop!
Go it!	Up!
Hold her still.	Stop!

The above expressions might be multiplied *ad infinitum* and not misrepresent the average practice in some of our best engineering shops. A curious part of it is that the same man will use half a dozen different phrases in succession to express the same order. This lack of uniformity has a tendency to cause accidents, especially where words are indistinctly spoken and where the noise of machinery helps to drown the voice. Besides this, the lengthy phraseology wastes the extra time it takes to penetrate the cranium of the operator and start to a proper wiggle-waggling the ultimate atoms of his inner consciousness. OBERLIN SMITH.

Bridgeton, N. J.

Length of Electric Arcs.

Editor American Machinist:

In your valuable paper of March 4th, in the article "Fire Protection Against Electric Lighting," there are two statements that certainly will be new to those who have used the electric light for years. Mr. Atkinson says: "If the wire is broken the electric spark will follow from one broken end to the other from one to six feet." There are very few persons who have seen an arc more than six inches, and, no doubt, many of your readers must have thought at the first reading that Mr. A. meant inches instead of feet, but, in another part of the report, he uses the words "several feet." The danger of fire from this cause is not considered great, and with wires put up as they should be, would not begin to compare with the breaking of gas pipes and the burning of the escaping gas.

So far as the damp wood is concerned, the wires must be of very poor copper and very near together to have a "cross arc," the law being that the current will follow the best conductor.

A glance at the tables will show that copper is among the best conductors, while salt is far down in the list.

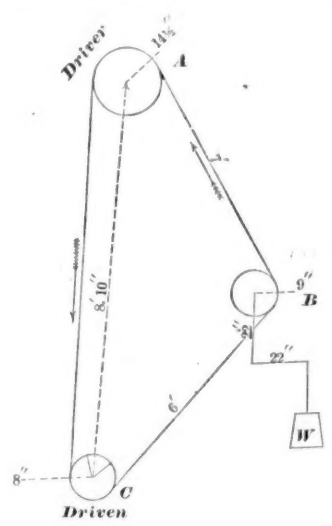
CHARLES STOWELL,
Ansonia, Conn. Electrician.

Power Required for Cutting Tools.

Editor American Machinist:

In order to satisfy Mr. Grimshaw and many others, allow me to state the following: None of my experiments have been made with a view of determining what horse power is required to remove a given quantity of iron or other metal. With the co-operation of others more skilled than myself, I hope to produce some exact ratios before long.

Herewith is a sketch of my tightener rig, which I think has some novel features,

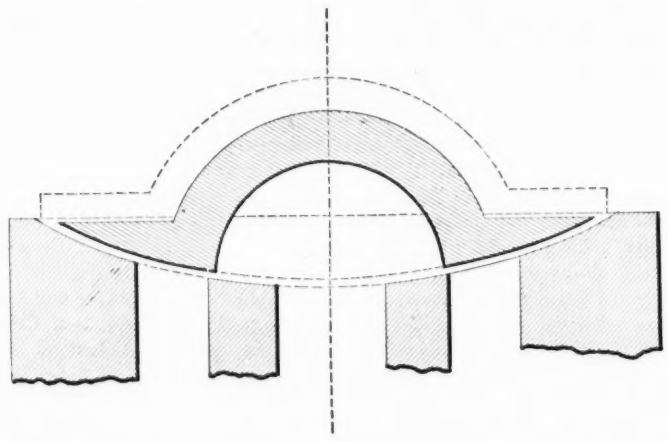


though it is by no means new. As ordinarily placed in the slack of the belt, a tightener has a tendency to increase the arc of contact and consequently its driving power. By reference to the sketch, it will be seen that the tightener being placed in the lead, or driving part of the belt, and considerably at one side, will behave in a far different manner. When the tension of the belt exceeds the power of the weight *W*, the weight rises and the belt slips on the pulleys. In making experiments with this rig the belt should be kept as near the same length as possible. Memorandum from a recent test shows the following:

Belt—3½" wide, single ply, old and well stretched; speed, 400 feet per minute; pulleys, cast iron turned; *A*, 14½" diameter, *B*, 9", *C*, 8", placed as in sketch; tension of belt, 18¼ lbs. per inch of width; weight on tightener, 21 5/16 lbs.; lathe in gear, speed of work (2½" diameter shaft), 18 feet per minute; depth of cut, 5/8"; feed, 36 per inch; one tool.

In my next, I will explain the cutting tools I used, and also suggest a method of increasing the cutting capacity of milling cutters for gear machines.

HERBERT S. WILSON.



Peculiar Wear of a Slide Valve.

Editor American Machinist:

I enclose a sectional view of slide valve belonging to an engine which the writer overhauled a few years ago, this being brought to mind by the question of C. C. H., in your issue of March 4. On this engine (7x9 vertical, 140 revolutions per minute) was an old-style throttling governor, the valve of course having a constant travel, or the opposite of C. C. H.'s, with variable stroke of valve; therefore it shows the liability to such action in all engines under certain circumstances. This action as shown in sketch, was completed in the short space of 7 weeks, and may be called extraordinary. The variable stroke may have a tendency to increase the peculiar wear, but this is a case in which the cause is certain, the wear being the result of the inability of the man in charge, who, when the engine was set up was cautioned as to the result of carrying low water. This made such an impression on him that he totally ignored the other extreme, and carried water clear above his gauges, and at times no doubt to the steam pipe,—the boiler having a large heating surface, and steam pipes sloping to the engine. The latter acted as a siphon at times and the engine was run principally by hot water. The result was to grind away the valve and seat as shown, until the valve had regular knife edges, and had actually shortened itself to the amount shown by dotted lines, the original thickness of valve being 11/16 of an inch.

I have found valves worn slightly this way, when superheated steam was used, but this is the worst case that ever came to my notice.

L. A. P.

Steam Engine Economy.

Editor American Machinist:

Votre Ami, in your issue of February 11th, expresses himself as surprised at the innocency of the little query I tried to tack to his communication of January 28th, but since it had the effect to draw his fire I shall insist, even if he is so modest as to deny it, that notwithstanding my "gun contained nothing but cotton" it went off to some purpose. Although I "did not know what it was loaded with," Votre Ami will allow me to suggest that I did not object to his plan of making the stroke of piston equal two diameters as *only* approximating minimum condensing surface. I was anxious to find out if it *did* approximate minimum surface.

He don't care whether my piston is 4½ inches or 4½ feet deep so far as condensation is affected thereby, which, of course, settles the matter very comfortably for him, but it don't help me any. My trouble, in this respect, is that I do care, and notwithstanding he is not alone in his condition of negativeness, expect to care all the way up to a piston the depth of which equals its stroke; that is, until it is demonstrated that the interior of a cylinder can be subjected to remittent heating and cooling by moist steam without loss.

I must confess to being too stupid to see the application of the "pint tin cup" and "dish-pan" illustration. It takes too much imagination to expand my query from a tin cup to the proportions of a vulgar dish pan. I modestly suggested the possible propriety of cutting 14" from his 28" stroke, maintaining, of course, *the same piston speed*. Instead of drinking coffee from the dish pan, this looks considerably more like taking two half-pint cups as wanted, in preference to setting down the pint cup half full between drinks, by which it gets cool when it is wanted hot.

Your correspondent says the loss of heat within the cylinder is due to three causes, "viz.: 1. Conductibility of the material. 2. The steam coming in contact with surfaces colder than itself, or ratio of internal surface to steam used" (which latter clause must be taken to include the steam coming in contact with surfaces hotter than itself, or, perhaps, the most important consideration is omitted). "3. Length of time the steam remains in contact with these surfaces." After making his statement of the causes, he admits that the cutting off 14" from the 28" stroke would result in reducing the loss due to the third cause, but asks: "Why not, at the same time, reduce the loss of heat—due the second cause—still further by making the cylinder, say, 11" x 22"?" Simply because the discussion is on a 14" cylinder at 373⅓ feet piston speed. Since, however, he prefers to change the diameter of his piston, it would be interesting to know why, if cutting down the stroke one-half in the case of the 14" x 28" cylinder, a saving is effected that required, by his own showing, an increase of piston speed equal to nearly 60 per cent. and a corresponding decrease of area to neutralize, the same course adopted with the 11" x 22" would not be equally satisfactory? Votre Ami will hardly care to say much in favor of comparing the refrigerating effect of a cylinder 11", with one 14" in diameter, or, if he does, he will not find any one to argue that the loss from condensation in doing the *same work* will not be less in the small cylinder.

I am not aware that any one *knows* very much about cylinder condensation, but it would seem that until something definite is known, the dividing of total time into times of revolution, is, to say the least, rather indefinite.

According to the example given by Votre Ami, by making the cylinder 11" x 22", he would save about 6 per cent. over the 14" x 14" cylinder. This gain—taking his own figures for it—does not result from making the stroke equal two diameters, but since he increases the speed and decreases the area of cylinder, as previously stated, about 60 per cent., it is manifest that it has resulted in spite of the fact that he increases the stroke. I believe, in this example, he has clearly indicated what would be the result in practice, but he would have expressed exactly what he has expressed by saying that the exposed internal surface in the 11" x 22" cylinder was about one-half foot less than in the 14" x 14" cylinder, and this is all the saving his figures show or he claims. He has simply indicated how the work of the 14" x 14" cylinder may be done by a smaller one, but in doing this he has named proportions, that when looked at simply with a view to reduce cylinder condensation 6 per cent. requires an increase of piston speed of 60 per cent., which, of course, throws all comparison out of question.

Reasoning, as he shows me how to reason in his example, I find that there is more than four square feet less of exposed surface in the 14" x 14" than there is in his 14" x 28" cylinder, and this surface is exposed, practically, one-half the time to the heating effect of steam that is doing work, and the other half to the cooling effect of the exhaust. This is, without taking into account the influence of clearance, which is proper enough, and admitting (which I do not believe) that the depth of piston is without influence.

Your correspondent quotes from the circular of the builders of a steam engine, what is really good reading, but at the same time has absolutely no bearing on the question of condensation in the cylinder, except as this consideration is modified by a hundred others. Perhaps if he had supplemented this extract with his own sensible remark that "The subject of steam engine economy is so broad that it can never be exhausted, and the idea which I touched upon is merely one grain of sand on the beach," he would have indicated what is probably the fact, viz., that other considerations—than "making the cylinder of such proportions as to introduce the least amount of internal surface for a given volume of steam"—entered into the determination of the proportion of stroke to diameter, adopted by the parties to whom he refers.

H. F. F.

Steam Engine Economy.

Editor American Machinist:

I see your late correspondents upon the above subject, F. R. Williams, and Drag Link have both been caught in the same trap. Perhaps it is quite natural that they should be, for there was a time when I would have nibbled at the same bait. I don't mean to egotistically assert that I am right, for we are all liable to make mistakes as long as we are human, and I shall at any time thankfully accept a correction, when presented in the right spirit. But let us not jump at conclusions.

As your correspondents' conclusions, in their criticisms of my suggestions, are just as honest as my own, and we still can not agree, I will ask permission to invite them to follow me a few moments, and we will try to reason together.

Cylinder proportions, as deduced in my

article in the AMERICAN MACHINIST of January 28th, is what they both take exception to.

There are two ways in which the subject may be looked at. The first is this: The steam entering the cylinder at the beginning of the stroke comes in contact with one cylinder head and one piston surface, and no cylinder surface except the clearance band. As the piston advances in its stroke, it uncovers gradually the cylinder surface, so that the steam is in contact with an element of this surface at the middle of stroke, only one-half the time of the stroke. At the end of the stroke the steam remains in contact with this surface only an instant of time. But with the cylinder head and piston surfaces the steam remains in contact during the whole time of the stroke. Hence, by striking an average, we would have steam contact with one cylinder head and one piston surface during the *whole time* of stroke, and with cylinder surface *half the time* of stroke; or, which is equivalent—condensation being proportional to both surface and time—*one* cylinder head, *one* piston surface, and *one-half* of cylinder surface during *whole time of stroke*. "Formulating this by calculus, we find the minimum surface (or condensing action) when the stroke equals" *two diameters.*

That "eminent engineer" has taken into account cylinder surface which "belongs to another cylinder, and might as well be a mile away."

We must bear in mind that it is really the minimum condensing action that we wish to obtain, and not a minimum of the surface actually inclosed between the piston and cylinder head at the end of stroke. If we were going to build cylindrical vessels for capacity only, and have them closed at both ends, then it would be correct to make the length equal to the diameter in order to require a minimum amount of material to build them for a given capacity, but in the case under discussion, *time* as well as surface plays an important part, and must not be neglected.

Another way of looking at the subject is this: When the steam is admitted to the cylinder its temperature is higher than that of the cylinder, consequently, heat will be transmitted from the steam to the material wherever they come in contact with each other.

As the piston advances, the steam continues to be cooled by the surfaces with which it is in contact, the additional surface continually being uncovered by the piston as it advances in its stroke, as well as by the expansion of the steam in performing work. This last, however, is no loss. As soon as the exhaust port is opened the steam will expand very rapidly and consequently its temperature will fall much below that of the metal surfaces, hence, heat will now be transferred from the metal to the exhaust steam and carried out with it and wasted. Now I trust it will be seen that all the metal surfaces with which the steam is in contact, are instrumental in wasting the heat during the whole revolution of the engine, taking the heat from the live steam and reducing its pressure during the first half revolution (or part of the forward stroke), then transferring it to the exhaust steam to be carried away by it during the latter part of the revolution. This, for one end of the cylinder. But at the other end of the cylinder we find the same condition of affairs. Hence, we see that as the piston advances the exhaust steam is carrying away heat and cooling the surfaces in front of it, and at the same time the surfaces behind the piston are drawing heat from the live steam, which, in turn, is again carried off by the exhaust. Thus the exhaust steam becomes an accomplice to the sneak thief, "condensing surface," and the more we can reduce his territory, the more heat there will be left in the steam to perform the work intended. Now, taking the time of one revolution, we see that the surfaces *continually active* in wasting heat, are—not considering clearance, etc.—two cylinder head surfaces, two piston surfaces, and the whole cylinder surface, equal in length of stroke, to two volumes of steam. "Formulating this by calculus we find the minimum surface (or condensing action) when the stroke equals" *two diameters.*

Now, if that "eminent engineer" will study the subject a little, perhaps he can laugh again, for "he who laughs last, laughs best." C. A. SMITH, (VOTRE AMI.)

Providence, R. I.

Voyages at Sea.

Editor American Machinist:

In port, the first thing an engineer should know is how long the ship will remain there. Having found this out he plans his work accordingly. If we are to remain only a day or two, we will examine and repair only such parts of the machinery and boilers as require immediate attention, but if we are to stay for a week or more we will give our department a more thorough examination. We will haul fires, and when the steam pressure has fallen to two or three pounds we will open safety valves and keep them open till the pressure is all out; then open bottom blow out cocks, and let the water run out.

Some engineers will blow the water out and overboard under pressure, which is bad practice and injurious to the boilers. Others will raise the safety valves and blow off part of the steam, then close them and let the boilers cool down, letting the water out the next morning. This is entirely wrong, for by the cooling of the boiler with valves shut a vacuum will form in place of the steam. This is very injurious to the boilers, for a pressure equal to that of the atmosphere is thus brought to bear on the outside of the shell, which is in a direction opposite to that intended. The consequence of this is, that the braces inside the boiler tend to weaken rather than to strengthen it. This is more injurious to boilers having flat surfaces than to those of a cylindrical form.

After the water is out of the boilers, remove hand-hole plate, and when the boilers are cool get inside and examine all bolts and braces to see that they are sound. Then scale the boilers if necessary and wash them out. See that all cocks and valves that belong to the boilers are tight. If they leak, grind or scrape them tight, and make the repairs on boilers that are necessary.

The engine should be examined, cylinder cover removed, piston examined, and if packing rings are cutting they must be scraped, replaced and plumbago mixed with oil in the proportion of ½ pound to a gallon, used. This will stop the cutting and put a fine polish on the cylinder and piston rod.

From indications while at sea, we have reason to believe that our shaft is out of line, and to prove it we will put the cranks on the top center and measure the distance between them, then put them on the bottom center and measure as before. If the distances are not the same we know they are out of line. For instance, if the distance is greater when on the top center than it is on the bottom, we know that the outer ends of the shaft, or one or the other of them, is down and should be raised. We can tell if they are true fore and aft by putting cranks on fore and aft centers, and measuring as before. If the distances are unequal they must be moved until they are equal. To raise the outboard end of the shaft we use a screw and a nut, to which is fastened long rods reaching from nearly the top of wheel house down to the shaft. The rods are bolted to a piece shaped like the letter U, which is passed around the shaft. Then, by turning the nut above we raise the shaft as high as is necessary. Raise the bearing and line it up. We must not forget to raise the spring bearing in the same proportion.

The air pump should be examined by raising the cover and floating top. See that the valves are right, packing tight, nuts screwed up, &c.

The tubes in condenser should be tested, and if they leak, plug them or put in new ones. If they leak, we are feeding so much salt into the boilers. An engineer can tell by the working of his engine what work ought to be done, and it is well to have a book and note down such things as come to our notice, otherwise, little things which at the same time may be of great importance, will be forgotten. All leaky cocks and valves should be made tight; all the pumps for fire purposes, donkey boiler and engine, steam steering gear, steam windlass and hoisting engines, and all pipes for carrying either steam or water must be put in repair by the engineer. He must also secure fuel and stores for the continuation of the voyage. It will be seen that the chief engineer of a large steamship has a great deal under his care and keeping. Consequently his assistants, let them rank as first, second or third, if they are faithful and do their duty, are greatly appreciated by him.

Corning, N. Y. STARTING BAR.

Rapid Melting Criticisms.

Editor American Machinist:

Writers are sometimes like lawyers; that is, when they lack a plain case and are afraid of not gaining their point by giving straightforward facts, they will resort to mere words without facts, which plan often gains their point by confusing the listeners' ideas, causing them to forget past *testimony* and remember the present *talk*.

Mr. Kirk's excuse for not answering my article of July 16, 1881, until Dec. 31—a little over six months—which he calls "the other day," makes me think of what the boys mean when they say "that is too thin." I should say this was not fair, as the time is too long for readers to remember what was said or written on the subject, and they will hardly bother to hunt up all past articles relating to the discussion.

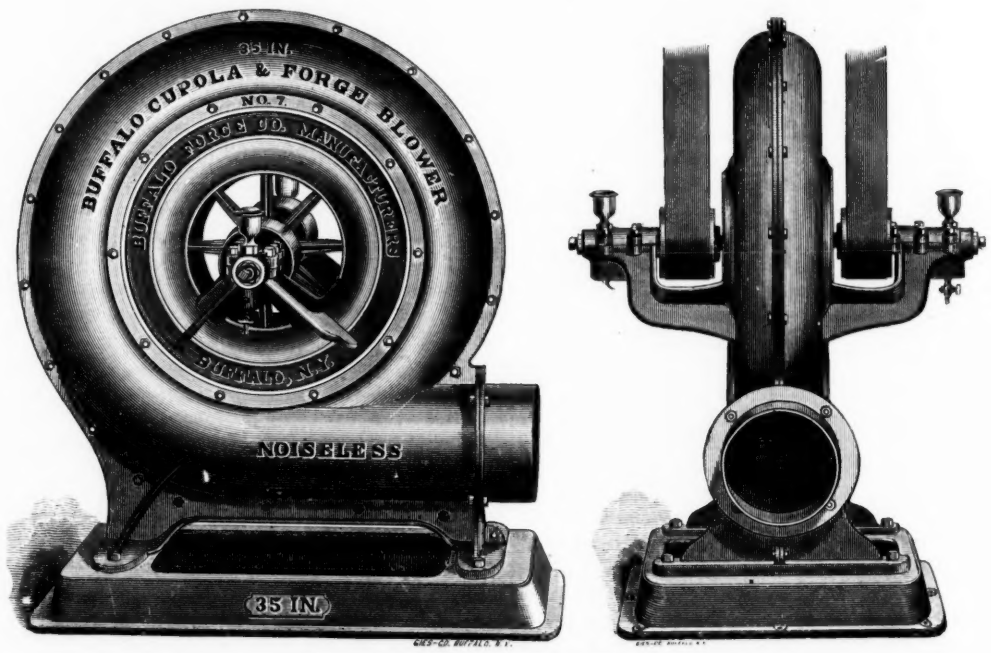
Mr. Kirk says, in his article of Feb. 25, 1882, that he considers my plan so far behind the age that he did not think it worth noticing, so that when he did answer it, he must have changed his mind. The rest of Mr. Kirk's article is written either for a blind, or to get out of the question by feigning to have misunderstood my plan of charging, as he tries to have the reader think that I stated the coal was all on the inside and the iron on the outside. He says I am the first man he ever heard of who proposed to melt iron in this way. I wonder if Mr. Kirk thinks I am a fool, or that I wrote about something I did not perform. The statement regarding my plan of charging, I am sure, did not read as he would have it. Mr. Kirk says that I endeavored to show what wonderful results I could produce by this plan of charging. He can call it wonderful, or anything else he chooses, but iron can be melted as I stated, notwithstanding he says, the plan is impracticable. I think it will be acknowledged by most readers to accord with the title "rapid melting."

Regarding the amount of fuel that I used, I acknowledge that he can make me appear extravagant by the figures given, but for any man to set up a rule that 9, 8, 7 or 4 pounds of iron should be melted to every pound of fuel in all cupolas the same would, I think, go to show that he has had very little experience in the handling of different cupolas, or that he does not think very deep. Show me a cupola that has melted with speed or rapidity an average amount of iron for its size, and I think that I can show you one that has not been extra extravagant in the use of fuel.

No two cupolas will melt with the same economy of fuel, no matter how carefully they are run; owing to little differences in construction, blast pressure, etc.

I will say to Mr. Kirk, in conclusion, that this mode of charging, which he claims will take double the amount of fuel, and is impracticable, is done every heat by the proprietor of a foundry that makes heavy rolling mill castings in a shop that I have had the charge of, his reason for so doing being that he can melt faster and with no more cost for fuel than when charging the ordinary way.

THOMAS D. WEST.



IMPROVED PRESSURE BLOWER.

Improved Pressure Blower.

We present herewith engravings representing two views of an improved pressure blower made by the Buffalo Forge Co., Buffalo, N. Y. The different parts of this blower are bolted together with a view to making them easily accessible for repairs, without the necessity of taking the blower apart.

The shaft is made of best steel, with long ample journals, and the boxes are provided with an oiling arrangement, so constructed as to prevent the oil from working into the pulley and getting on the belts. The waste oil which passes out of the inner end of the journal box is received into a chamber which extends under the box, this chamber being provided with a cock through which it may be drawn out. By this means the belts are kept in good condition and the inside of the blower is kept neat and clean, instead of getting clogged and gummed with oil.

The blast wheel is made of the best composition (brass) and galvanized iron, and the blower in all parts well fitted in accordance with the knowledge gained from practical experience in the manufacture of similar appliances.

There are indications that the builders of machine tools will not be so much overcrowded with orders during the coming summer as they were throughout the warm weather last year. The demand for small lathes is but little, if any, ahead of the supply. Heavy tools, on the other hand, are difficult to obtain as soon as required, and shops for producing them are not multiplying.

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NEW YORK, MARCH 18, 1882.

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Reducing Cost of Machine Shop Work.

The ability of any fairly-equipped machine shop to do a profitable business at the present time is unquestioned; ratio of profit to value of work turned out depending, of course, upon shop facilities and the careful watching of expenses. Any careful observer will notice, however, that there must be considerable disparity between the margins of profit of different establishments producing the same articles in about the same quantity. In some instances of the kind, profits are probably double what they are in others. This disparity is almost always due to one or more simple causes, such as incompetency of superintendents and foremen, bad location of shops, poor working tools, and lack of proper business acumen in purchasing supplies and selling shop products. Many proprietors of machine shops are doubtless aware of the fact that they are not making as large profits as their competitors, who make no better articles and no more of them, but while securing what seems to them very fair margins on sales, are possessed of a quiet easy disposition which allows the same state of affairs to continue week after week and month after month, without any special effort to remedy the situation. If the present business boom were to continue forever, shops conducted upon the easy-going plan could perhaps keep running with reasonable satisfaction to their proprietors; but as orders are likely to become scarcer and harder to obtain some months or years hence, it is only a matter of time when quite a number of these shops will either have to change managers or shut down. Perhaps in most shops the cost of turning out work could be lessened by judicious improvements. Many of them are cautiously studying and adopting such measures as will enable better work to be produced at less expense, and these are the establishments that are destined to run with balances on the right side of the ledger in the dull times that sooner or later we must expect, when some of their competitors, who have not given suitable attention to the minor as well as the major shop economies, can not execute orders at prevalling prices without loss.

There are comparatively few shops that need a "general overhauling" to bring them up to the proper standard. In most cases radical changes should be gradual and well considered. It is not so much the overturning of existing methods and processes (unless they be extremely bad) that insures the most satisfactory results, as persistent examination into minor devices and plans that promise to facilitate work and the prompt adoption of such as prove advantageous. "Eternal vigilance" is no less the price of liberty than the price of successful machine shop management. By the expenditure of a portion of the profits for a time, in making special tools and fixtures to cheapen and improve production, the best foundation is frequently laid for future profitable business in the face of sharp competition. When dull times again appear the wisdom of thorough preparation for turning out a first-class product at low cost will be strongly apparent.

Machine Æsthetics.

Viewed in the light of presenting something that is pleasing to the sight of the uninitiated, the standard production of the machine shop has not progressed during the past twenty-five years, but rather the contrary. That is, take a standard machine tool, the engine lathe, for instance, and more effort was made in the direction of structural beauty, simply for the purpose of presenting pleasing forms to the eye, by the leading manufacturers then, than is made by the same class to-day. Every one has more or less of undefined reverence for the beautiful wherever it is found, and old-time machine design had a good deal of reference to this fact.

At the present time the artistically beautiful has given way to the useful to such an extent that a machine design must carry with it a useful reason for every form it presents, or it is looked upon with more or less distrust.

The members of the engine lathe are substantially the same as they were twenty-five years ago, but they have graduaHy taken on a utilitarian form, to the elimination of anything that could be construed into a distinct attempt at structural beauty. In such a degree is this true that the observer is often struck with the evident intention of the designer to strain a point to make lines of beauty appear, at least, to serve a useful purpose; as if conscious of the fact that there was an apology needed for making a machine look well.

This is no more true of the engine lathe than of all classes of what may be called current machines and machinery, but the engine lathe is one of the most common examples. For instance, there is nothing particularly handsome about the modern steam engine, but viewed from an engineering stand-point it looks altogether well. The forms its parts assume are pleasing to those who are educated to look at it as machinery for doing useful work.

In this, as in nearly all respects, the architecture of modern machines and machinery is concluded by a consideration of putting material where it serves the useful purpose for which the machine was constructed, and by an almost total disregard of how the shape appeals to the eye of any except those who look at the aggregation of parts as a machine.

With reference to finish, simply as finish, the foregoing will apply. Not nearly so many parts of a machine are finished (polished), as were formerly, and generally the quality of finish is not so high. The shapes of many parts of a machine that were formerly made with particular reference to a high finish, are now such as to render finishing by other means than painting practically impossible. As in the forms of the parts, so in the finish some good reason must be shown for it, or it is hardly admissible.

If it were inferred from this that there was nothing of the æsthetic about machine design and construction, it would be a mistake. On the contrary, there was never at any other time so much of this as at present. It has simply changed conditions, so that its appreciation appeals to other senses as well as the sense of seeing. Forms are no longer considered beautiful because they merely please the eye, but they please the eye because they appeal to a more substantial consideration of their purposes. The consideration of these purposes implies, not a lack of the conception of the beautiful, but rather a more complete conception of it.

The fact that highly finished parts, where painful attempts to devise shapes to be finished are apparent, are not approved, as well as the fact that the perfection of wearing parts that do not appeal to the eye—the making of cylindrical parts *cylindrical*, and flat parts *flat*, in a degree that was formerly believed to be neither practicable nor necessary—are considered a part of the beautiful in machine construction, is evidence that the truly æsthetic is quite as much cultivated in the mechanic arts as in anything else.

A Suggestion.

The recent discussion in our columns, under the head of "Steam-Engine Economy," of the effect of cylinders of different proportions of diameter to stroke in influencing the loss from internal condensation, will remind our readers of how little is known as to the actual condensation, and consequent loss, that takes place from this cause in the cylinder of a steam engine working with different steam pressures, and at different points of cut-off. The solution of the problem of steam-engine economy may be said to wait upon some definite knowledge on this subject.

To be of avail, this knowledge must be of such a character as to be logically applied to any conditions that do or may be supposed to exist; so that knowing, for instance, the average and extremes of temperature, and other data of circumstances or existing conditions that would influence the result, that result could be calculated with certainty, or at least with reasonable accuracy.

As previously intimated a lack of this knowledge almost bars the way to further progress in exact knowledge of steam engineering, and the discovering and popularizing of the solution of this question would be of incalculable value in a practical sense, besides having the effect to stop a large amount of theorizing in that direction.

The solution presents undoubted difficulties, but there is no reason for believing them insurmountable; on the contrary there is reason for believing that many things in relation to the subject that now look difficult would be found comparatively simple if attacked persistently, while the end would be worth any amount of effort.

Why cannot some of our engineering societies take hold of the matter and settle it definitely? We offer this as a suggestion, and venture the statement that the knowledge would be of a good deal more importance to the civilized world than a knowledge of some other things, the search after which has cost a great deal of money,—a knowledge of the precise condition of things at the North Pole for instance.

We are informed that an Indiana establishment, about to erect some machinery for its own use, has ordered castings from England at 2½c. a pound. The price asked by a local foundry for the same was 4c. a pound. As there is a duty of $7 a ton upon pig iron, and it necessarily costs something to transport heavy castings from England to Indiana, we should like to know why they can be imported cheaper than they can be made at home. Perhaps some of our readers can give us figures as to actual cost of making iron castings in England and in the Mississippi and Ohio valleys.

One of our Canadian readers says: "Will you kindly invite correspondence through the medium of your valuable paper as to the best method of shop lighting where gas or electric light is not obtainable?"

We should be glad to hear from any one who can give results of satisfactory experience in regard to shoplighting.

Quantities of potatoes are being shipped from Europe, the freight on which is $6 to $7.50 a ton. This traffic we learn has caused a strong advance in the freight on Scotch pig iron, thereby acting as a check upon its importation and strengthening the market here. Steamers from Glasgow find it more profitable to load with potatoes than with iron.

An Ohio reader sends us a copy of a bill now before the legislature of that State, providing for the limiting of prison convicts employed in any single branch of industry to 100, and the hours of daily labor to eight; also the following petition for the passage of some act to stop prison competition, which is being signed by the manufacturers and mechanics of that State:

To the Honorable General Assembly of the State of Ohio.

GENTLEMEN: The undersigned, your constituents, respectfully call your attention to the convict labor system of our State. We respectfully claim that, as conducted at present, it is injurious both to outside manufacturers and mechanics. To the former, in that they are compelled to place their wares or merchandise on the market, at such a figure as to compete in selling price with the productions of convict labor; to the latter, in that this selling price necessarily implies low wages, so as to compete with the wages of the convict.

We respectfully represent that the system is unjust, if either of these facts exists in the management of our prisons or eleemosynary institutions, and ask your Honorable body to take such steps at the first opportunity to investigate and remedy the evil, and thereby remove the stigma that honest labor is compelled in the State of Ohio to compete with that of the convict. We are not of the impression that for the purpose of saving a few thousand dollars annually, our State ought to compete with its citizens in several branches of industry.

Our grievance not being one of sentiment, we are in hopes your Honorable body will grant the relief prayed for.

The above petition is a good one to sign, but no 100-limit bill, should it become a law, would "grant the relief prayed for." The true way to remedy an evil is to abrogate it, not to merely modify its proportions.

Literary Notes.

OUR WORKSHOPS AND WAREHOUSES. THEIR SANITARY AND FIRE-RESISTING ARRANGEMENTS. By B. H. Thwaite, C. E., Associate Member of the Institution of Civil Engineers, Fellow of the Chemical Society. 8vo, cloth. Price, $3.50. Published by E. & F. N. Spon, 446 Broome Street, N. Y.

The author, in his introduction to the book bearing the above title, calls attention of employers and proprietors of mills and manufacturing establishments to the absolute necessity of a more careful consideration of the health of their employes, also the sanitary regulation and fire protection of their buildings.

The ground is also taken and proven that the education and elevation of their employes to a still more respectable standing in the community is worthy of their increased interest and efforts, and will more than repay them in the end for their outlay.

The book begins by selecting the locality for the factory, lays the foundation, puts up the building, then arranges all the details of drainage, sanitary arrangements and fire apparatus.

These are each illustrated by appropriate engravings. The part devoted to apparatus used for the supplying of factories with any quantity of pure, moist air, at any desired temperature, is worthy of careful perusal; together with the plans for ventilating offices and apartments.

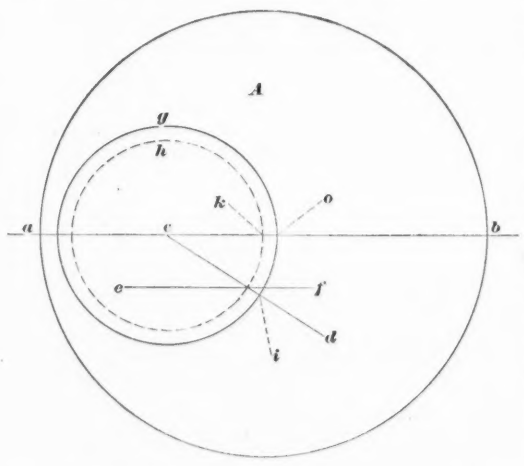
Valuable hints are given for the prevention of accident through the carelessness or ignorance of employes. It would be well if some of the fire-escape apparatus described were adopted at once in many of our factories and mills.

The author dwells at length on the fire-proof construction of buildings, and gives the most modern discoveries and methods adopted for specific purposes and in special cases.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(84) W. J. B., Jackson, Mich., asks: Will you please give me a rule by which I can set the eccentric of a steam engine the right distance, either ahead or back of the crank (as may be required), when the center line on eccentric and a line on shaft at right angles to the crank are previously made? *A.* To determine this you must know the lap of the valve, and determine the lead you will give it; then make a diagram as below, in



which *A* is the eccentric, the outside of which is described from the center *k*. The line *a b* is the line described as the center line on eccentric, the dotted circle *h* represents the travel of the eccentric, and the circle *g* represents the shaft. At *o* is a point in the line referred to as being at right angles to the crank. Draw the line *e f* parallel to *a b*, and at a distance from that line equal to the lap and lead of the valve. Draw the line *c d*, cutting the line *e f* and the circle *h* as shown. The distance from *o* to *i* (where the line *c d* cuts the circle *g*) indicates the distance the eccentric is to be moved on the shaft. This will apply to all ordinary cases, but, of course, if the center line of the eccentric motion is inclined at an angle to the piston motion, this position of the eccentric would not be correct. In the latter case the eccentric must be advanced the distance from *o* to *i*, measured from a point, or line across the shaft at right angles to the center line of eccentric motion.

(85) W. G. N., Amesbury, Mass., asks in reference to balancing pulleys, in answer to which we refer him to an article on that subject in the AMERICAN MACHINIST of August, 1878.

(86) J. W. O., Owensboro, Ky., asks: Can you tell me of a bath for tempering mill picks? *A.* You can try the following: 4 gallons rain water, 2 ounces corrosive sublimate, 2 ounces saltpeter, 3 pints rock salt. Heat to cherry red, and cool in the bath.

(87) G. H. P., Woodville, Mass., writes: I am drawing an upright engine with a cylinder 4″x4″, which I wish to run at 500 revolutions, steam pressure 100 pounds. Is it best to put one valve in the middle or one at each end, and what should be the proportion of the valve or valves? *A.* Make single valve. Ports in cylinder, 3/8″x3 1/8″; outside lap of valve, 5-16″; inside lap, 1-16″; travel of valve, 1 1/8″.

(88) J. M. G., Fort Wayne, Ind., asks: Have railroad companies who have a certain number of locomotives a legal right to increase that number by building new ones? *A.* There is no law that will hinder a railroad corporation from building or purchasing all the locomotives they can pay for. You are right in your opinion that there are no patents in the way, except on some minor details.

(89) F. H. W., Philadelphia, Pa., asks: 1. How many feet per minute should the table of a planing machine run for planing heavy pieces of cast and wrought iron? *A.* From 15 to 18 feet. 2. What should be the proportions of rack, gears, pulleys, belts, etc.? *A.* To answer your questions would require the time of a good tool designer for some days, and would not be of general interest. By observation you can easily see what the practice of others is in this respect.

(90) James, New York, asks: 1. Which trade is the best one for a young man to learn? *A.* That depends on the young man's intelligence and inclination. It is generally best for any one to follow that business towards which he has a leaning. There are a dozen trades in which there is room for a young man to exert all his energy to a good purpose. 2. What is the proper age for a young man to begin a trade at? *A.* Opinions differ in this respect. Our opinion is he should be about 18 years old. 3. How can a boy get a place in a large marine engine shop, where he can learn the trade thoroughly? *A.* We believe it is not easy to get such places, nor would we advise you to spend much time in trying. You cannot have the machinist trade learned you in any shop in the world, but you can learn quite as much of it in one of a hundred other different shops as you can in a shop where marine engines are built.

(91) G. L., Hartford, Conn., asks: Will you kindly tell me the use of the dash-pots as applied to the Corliss engine, and give a description of the same? *A.* In some instances the dash-pot simply serves the purpose of arresting the motion of the valve after it has closed, in which case it is frequently a plain cylinder nicely fitted with a solid piston. A small opening near the bottom of the cylinder allows the air to escape before the piston, until the latter passes over the hole, when the imprisoned air arrests the motion without jar. Sometimes the pistons are provided with metal packing rings, and sometimes leather packing is used. Frequently the bottom of cylinder or the end of piston is covered with leather, to ease the shock if it should strike the bottom. In other instances, in addition to arresting the motion, they are used for assisting in closing the valves, a vacuum being formed underneath when the pressure of the atmosphere assists in the closing.

(92) J. P. M., Greenpoint, L. I., asks: Is it compulsory on the part of the Examing Board to grant papers to any one who applies and passes the regular examination, the applicant not having charge of any engine, nor any place in view in the State of New York at the time, but having had charge of and run an engine previously in another State? A. Yes. It is of no consequence to any one where you propose to run an engine, or whether you propose to run one at all or not. The point to be settled by the examination is, whether or not you are competent to do so according to the rules that govern the Board of Examiners.

BUSINESS SPECIALS.

Transient advertisements 50 cts. a line for each insertion under this head. About seven words make a line. Should be received Wednesday morning.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

James W. See, Consulting Engineer, Hamilton, O.

Presses and Dies. Ayar Mach. Works, Salem, N. J.

Alfred Wilkinson, Expert Tests of Steam Engines and Boilers, 123 N. 4th St., Phila.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

List of Machinists in U. S. and Canada; just compiled. Price $10. A. C. Farley & Co., Philadelphia.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

"To stop leaks in Boiler Tubes use Quinn's Patent Ferules. Address, S. M. Co., South Newmarket, N. H."

Wanted—A good specialty to manufacture on royalty or contracts for staple articles. S. McHenry, Machine Shop, 927 Filbert St., Philadelphia, Pa.

Circulars addressed to 50,000 Steam Users in the U. S. and Foreign Countries, embracing names of the largest consumers of steam power. The J. N. Mills Publishing Co., 165 Broadway, New York.

For Sale—A valuable patent on a Door Butt, by which a door can be adjusted any way you wish. For particulars address, C. H. B., Post Office box 498 Holyoke, Mass.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John Street, N. Y.

Important to Brick Makers.—Illustrated Pamphlet of Best Brick Machinery in the World, free. Address E. R. Gard's Brick Machine Works, Baltimore, Md.

"Slide Valve Gears," by Hugo Bilgram, published by E. Claxton & Co., Phila., describes the easiest method known for correctly proportioning slide valves, link-motions and cut-off gears; price, $1.00.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Frederic Egner, Engineer Norfolk (Va.) City Gas Light Company, writes to T. New, 32 John Street, New York: We do not need any Prepared Roofing this spring. If we did would certainly get yours, as it has thus far given complete satisfaction, and is in every way equal to your representation.

"Useful Information for Steam Users." A 100-page *Illustrated Pamphlet*. Contains interesting data on the care and management of Steam Boilers, and rules for engineers and firemen. Engineers everywhere should have this work. Sent for 25 cents in P. O. Stamps. The J. N. Mills Publishing Co., 165 Broadway, N. Y.

"Sibley College of Mechanic Arts, Cornell University.—Entrance examinations will be held June 12th and September 11th, 1882. For the register and catalogue just issued, containing reorganized courses of instruction, scientific and practical, including draughting, machine construction, general shop work, etc., apply to the President of Cornell University, Ithaca, N. Y."

"Patent Binder" for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, neatly bound in cloth, ready to ship by express, for four dollars. Unbound, three dollars. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

Ealy's "Blue Book,"—Special classified list of Machinists, Machinery, Railway, Engine and Boiler Makers supplies, etc., with financial standing and paying qualities of all dealers and manufacturers. Much more convenient and reliable than any other work of the kind published. We also furnish full detailed written reports. Price $30 to July 1, 1882. The JOHN W. EALY COMPANY, 51 Chambers street, New York or 79 Dearborn street, Chicago, Ill.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 Humorous illustrations; 320 pages, 12 mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

MANUFACTURES.

A. L. Aelt, Grand Rapids, Mich., is pushed with orders, and is running 18 hours per day.

The Rodney Hunt Machine Co., Orange, Mass. will begin immediately to build a machine shop and iron foundry.

A. D. Weymouth & Co., Fitchburg, Mass., are about to fit up a shop to manufacture their variety wood-turning lathe.

The Miller Company, Canton, Ohio, are building a foundry 20x80 feet. Eighty hands are employed, and their sales last year amounted to over 2,000 pumps.

The Straight Line Engine Company, Syracuse, N. Y., have just shipped an engine to Japan for an electric light plant. Their business is crowding as usual.

The Pittsfield Iron and Steel Company, organized in 1881, at Boston, have erected and almost completed large works at Pittsfield, Vt., for the purpose of manufacturing iron on an extensive scale.

The Michigan Tool Works, of Grand Rapids, report business good, and are forced to increase their business by building new tools. They are putting in a 30x14 planer, 30″ lathe, and 36″ upright drill. They are bringing out some new inventions.

D. Saunders' Sons, Yonkers, N. Y., are getting out a 12″ pipe-cutting and threading machine for the A. Burritt Hardware Co., Waterbury, Conn. This is a cutter of unusual size, the largest now in general use being for 8″ pipe.

James Mahony, 109 Liberty Street, New York, has applied ten of his Universal Furnaces in Virginia within the last month, also eight in New York. Orders for Mahony's corrugated grate bars are crowding the fullest capacity to supply them.

In our issue of March 4, 1882, the address of Minturn & Smith, manufacturers of the Automatic Cylinder Cock, described by us, was incorrectly stated. It should have been 225 Hanover Street, Milwaukee, Wis., or post office box 290.

The National Car Company, St. Albans, Vt., recently voted to issue $1,000,000 of new stock. The proceeds are to be used for building 2,000 new 34-foot 20-ton cars, which are needed by Canadian roads, and for the erection of car shops for the company.

The Star Paper Company, Shortsville, N. Y., will rebuild its mill at once, putting in the most improved machinery and substituting a Fourdrinier for the cylinder machine. The company will add steam power, and has secured increased water power. It will make hay and straw, news or manila as required.

Lindley Vinton has succeeded J. H. Kerrick & Co., at Indianapolis, Ind., and has quite a large depot for sale of machinery and machinists' supplies. Mr. Vinton also issues the Indianapolis *Mechanical Journal*, a monthly publication, very good for machinists to read. The very rapid growth of the mechanical industries of that city is decidedly favorable to the expansion of his business.

The Providence Steam Engine Company have opened offices in Philadelphia at 22 and 24 North Fourth Street, in charge of A. L. Dunton. They are constructing engines for the J. Barton-Smith File Company and Harrison Bros. & Co., of that city. Several large compound engines are also to be erected. Mr. Dunton has made some important improvements in the Green Automatic Cut-Off Engine.

The machinery is being put into the building (the old prison) of the Continental Construction Company, at Concord, N. H. In the old work shop there is now running six lathes, a moulding machine, circular and bench saws. The south wing has been fitted up, the first floor as dwellings, and the second as sleeping rooms for the workmen. The cells in the north wing are to be taken out. It is intended to use this wing for the foundry for small castings. The old wash-room is used as a blacksmith's shop. The offices of the company occupy the main building, which has been reconstructed on the inside.—*Boston Commercial Bulletin.*

Crocker & Pell, who have recently fitted up a new foundry and machine works at Minneapolis, Minn., will make steam engines one of their main specialties. They have among their tools a 16x4x4-foot planer, and a shaft lathe with 26-foot bed. Mr. H. S. Pell, of this firm, resigns a position as mechanical engineer and master mechanic of the Vulcan Steel Works of St. Louis to go into business for himself. They write us: "We propose to make good work, and keep up, as much as we are able, with the mechanical engineering progress in this country. This section is demanding finer work, and it has come largely from the East."

Some idea of the extent of the felt roofing business may be gained from the fact that, in the last ten years, a single manufacturer, T. New, 32 John Street, New York, has sold and applied over *fifty million* feet of his Prepared Roofing, the major part being placed upon manufacturing establishments. American roofing felts are now being manufactured to such an extent, that the importations of English felting have decreased 50 per cent. during the past two years. American manufacturers are now exporting prepared roofing to European markets, while the extended use of felt for roofing purposes is materially lessening the demand for shingles, a matter of some importance in view of the destruction of our forests.

The U. S. Mineral Wool Company, 16 Cortlandt Street, New York, have issued a circular under date February 27th, 1882, calling attention to the prominence into which the Spuyten Duyvil disaster has brought the practice of lining the floors of passenger cars with shavings, to keep the bottom of the car warm, deaden sound, etc., while greatly increasing the danger from fire. Following a statement as to the fallacy of attempting to insulate, by air-spaces of large dimensions, the circular enumerates the special advantages of mineral wool for insulating purposes, and says there are now in use in passenger cars 700,000 pounds of that commodity. The method is usually to pack three or four inches of the ordinary grade between the floor proper and a false bottom made of tongued or grooved stuff. The whole expense of lining a car in the most complete fashion is stated to be about thirty dollars.

The Detroit Cummer Engine Company, Detroit, Mich., write us: The following will show that this part of the country is not asleep. Among the engines recently shipped by us is a 14″x30″ to the Union Wadding Company, at Pawtucket, Rhode Island; a 20″x36″ to the Haskell & Barker Car Company, of Michigan City, Ind.; a 12″x30″ to Hatch & Mitchell, of Grand Rapids, Mich., besides a half-dozen more sold to the Nordyke & Marmon Company, of Indianapolis, Ind., to furnish power for mills they have erected. Our machinist has just returned from Morris, Ill., where he has set up three of the "Improved Cummers" in the one engine room for the Allen Paper Car Wheel Company. He is now at Toledo, Ohio, setting up a plant for the Brush Electric Light Company. Next week we will ship a 14″x30″ to John T. Noye & Sons, of Buffalo, N. Y., for their own works. We are compelled to run a force of men night and day in our endeavor to keep up with our orders.

In a recent issue we essayed to make a correction of a previous note in our columns to the effect that the Deane Steam Pump Co. had taken a gold medal award at the fair of the Massachusetts Charitable Mechanics Association last fall. We stated that the award had resolved itself into a silver medal. Our correction has been incontestably corrected by the exhibition in this office of the veritable gold medal awarded the Deane Co., at that fair, duly inscribed. It is now at the New York warehouse, 92 & 94 Liberty street, where Mr. John H. Harris will show it to any one interested.

Machinists' and Engineers' Supplies.

NEW YORK, March 4, 1882.

Trade is only moderate; not as good as it was a year ago. Prices, as a rule, are well maintained, but large buyers are holding off in anticipation of a decline.

C. W. LeCount, South Norwalk, Conn., offers his Standard Wrenches, *finished*, at prices ranging fron 30cts (to take ¼" and 5-16" nuts) to $2.25 (to take 1¾" and 1¼" nuts). Unsized and rough wrenches sell at about half prices for finished work. He has seven sizes ready for the market.

Iron and Metal Review.

Market for Pig Iron is quiet and prices are without material change. Buyers are holding off in anticipation of lower prices. We quote No. 1 at $26 to $27: No. 2, $24.50 to $25; Gray Forge, $22.50 to $23.

Selected No. 1 Wrought Scrap from the yard is held at $33.50 with short supply.

Ingot Copper is still dull, but holders are firm at 19¼c. Pig Lead is easier, sales of Common being made at 5.1c. to 5.15c. and Refined, 5.25c. The Tin market is quiet at 25c. to 25¼c. for Straits and Malacca; 25¼c. for Billiton and Australian; and 25½c. for Lamb and Flag. Domestic Spelter, 5¾c. to 6c.; and Silesian, 5¾c. to 5¾c. Antimony, 13c. to 15c. for Foreign, and 13¼c. for Nevada.

WANTED

"Situation and Help" Advertisements, 30 cents a line, each insertion. About seven words make a line. Should be received Thursday morning.

Situation wanted by a mechanical draughtsman. Address, BOX 3, AMERICAN MACHINIST.

Wanted—A skillful and first-class mechanical draughtsman. Apply, 153 Cedar St., New York.

A competent Engineer and Machinist wants a situation, Address, J. C., BOX 5, AMERICAN MACHINIST.

Four young, active and first-class pattern makers, steady work and good wages. Address, Alex. D. Cunny, Cincinnati, Ohio.

Wanted—A first-class draughtsman, capable of dsigning steam engine work. Address, THE WESTINGHOUSE MACHINE CO., Pittsburgh, Pa.

Wanted—Situation as draughtsman and inventor of Marine Engine Work. Good references. Address, A. F. FOGELQUIST, 511 E. 11th street, N. Y.

Pattern Maker Wanted—A good workman, if a steady and reliable man, can find a good situation with the Concord Axle Co., Fisherville, N. H.

Wanted—A foreman to take charge of a large machine shop occupied with heavy work, and employing about two hundred hands. Address, with references, Shumway, Burgess & Co., Chicago, Ill.

Wanted—An experienced mechanical draughtsman and pattern maker. Steady employment in a good place for the right man. Address, J. W. P., care AMERICAN MACHINIST.

Wanted—A good latheman to take charge of ten lathes, doing Portable Engine work. None but thorough, good lathemen need apply. Address, giving age, experience, class of work most accustomed to, and wages wanted. T. M. NAGLE, Erie, Pa.

Wanted—Foreman for Foundry employing fifteen to twenty hands. Must have experience in engine and difficult cored work. Applicants must give references and state experience in dry and green sand and loam work. Address, A. W. H., Middletown, Ohio.

A first-class machinery man is open for an engagement. Has large experience as salesman, buyer, correspondent or manager, and can fill any or all of above positions. Unquestionable references. Correspondence is solicited from any in want of a reliable man in the machinery business. Address BOX 15, AMERICAN MACHINIST.

I should like to re-engage as Superintendent or Foreman of large or small Machine or Tool works. Have occupied such a position the past eight years. Am familiar with electrical detail and the designing of all kinds of improved machinery. Would be willing to invest capital with a desirable party. Address, Robt. T. Slaiter, Box 7, AMERICAN MACHINIST.

Wanted—A competent, reliable young man to take charge of a machine shop. One who can fill the place can have an interest in the business, which is established and successful. Good shops, good work and good pay. A rare chance where the man is wanted more than his money in forming a partnership. Also wanted, a good blacksmith and four machinists, competent, reliable men. Address, Olin Scott, Bennington, Vt.

Horizontal Engine, Plain Slide Valve, 20 by 48 for sale. Atlantic Steam Engine Works, Brooklyn, N. Y.

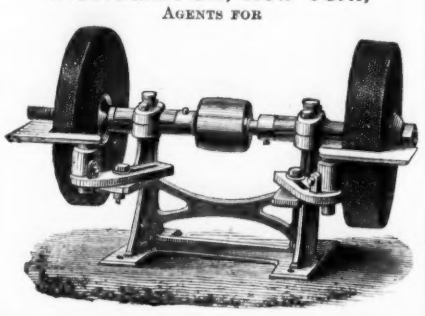
New Buckeye Engine
FOR SALE CHEAP.

Cylinder 14"x28". This engine has been RUNNING ONLY A FEW MONTHS, is guaranteed to be in perfect repair, modern and equal to any new one. Can be seen in operation at Planing Mill of Lockland Lumber Co., Lockland, Ohio. **Satisfactory Reasons** why this engine was **displaced by one of ours** of about the same size, will be given on application.

DETROIT CUMMER ENGINE CO.
DETROIT, MICH.

WORCESTER MACHINE SCREW CO.
WORCESTER, MASS.
AND 111 LIBERTY ST. NEW YORK
MANUFACTURERS OF
STANDARD MACHINE SCREWS.

COOKE & CO.
(Formerly Wm. Cooke, successor to Cooke & Beggs)
6 Cortlandt St., New York,
AGENTS FOR



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Our wheels possess superior cutting qualities, combined with great durability. Eureka Plow Polisher and Patent Stove Plate Grinders.

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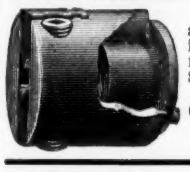

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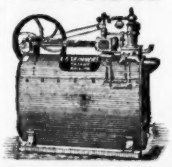

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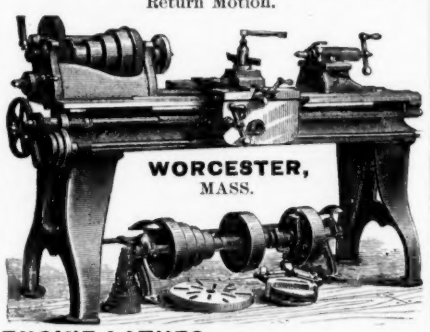
Successor to A. F. PRENTICE & CO.,
Manufacturer of
MACHINISTS' TOOLS.
IMPROVED UPRIGHT DRILLS,
with Lever Feed, and Wheel Feed with Quick Return Motion.



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HAND LATHES,
SLIDE RESTS, and
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CELEBRATED
WOOD WORKING MACHINERY
FOR CAR SHOPS, PLANING MILLS, &C.
Also Machinery for all purposes. Correspond with us.

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THE STANDARD
MANUFACTURED OF
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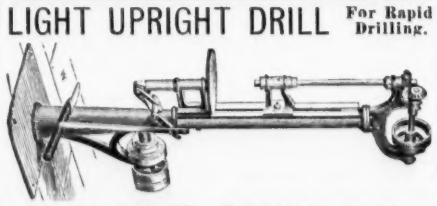
JENKINS BROS. 71 JOHN ST. N.Y.

LIGHT UPRIGHT DRILL For Rapid Drilling.



W. W. OLIVER, BUFFALO, N. Y.

"THE DEANE" STEAM PUMPS FOR EVERY SERVICE.

Send for New Illustrated Catalogue.

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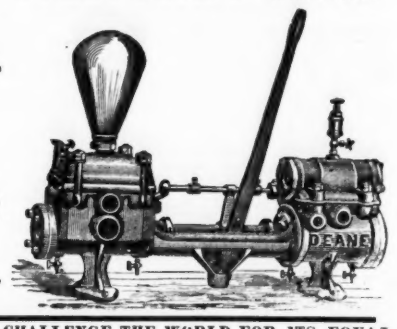
The Deane Steam Pump Co.
HOLYOKE, MASS.

92 & 94 Liberty St., New York. 54 Oliver St. Boston. 226 & 228 Lake St., Chicago.



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Patentees and Sole Manufacturers of the Excelsior Steel Tube Cleaners. $1.00 per inch. Most liberal discounts to dealers. Send for circular.

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Is the Standard of Excellence
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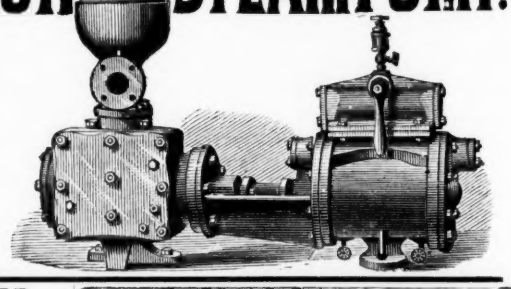
STEAM PUMP WORKS,
Foot of East 23d Street, New York.



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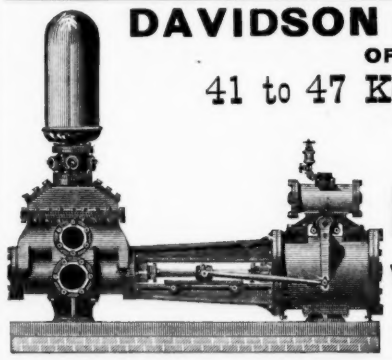

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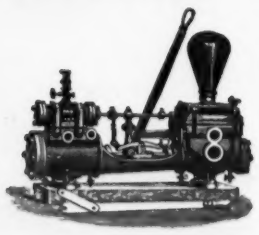

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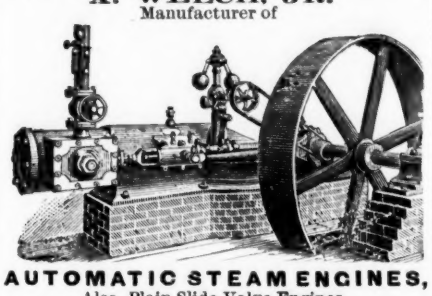

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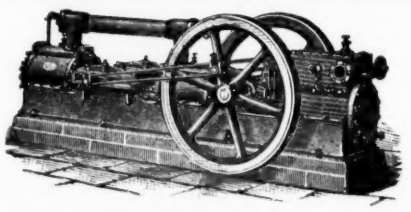

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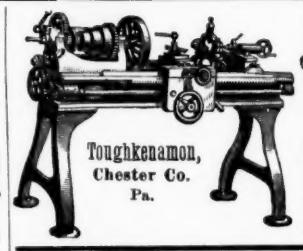

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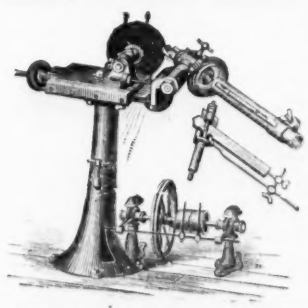

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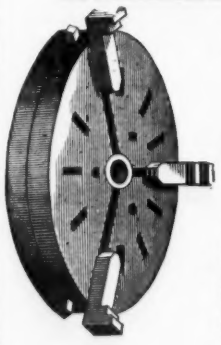

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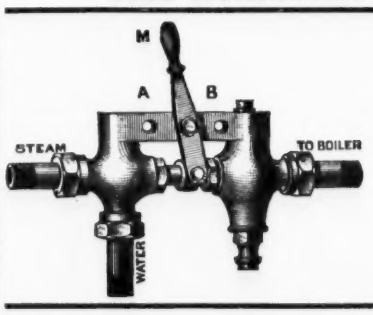

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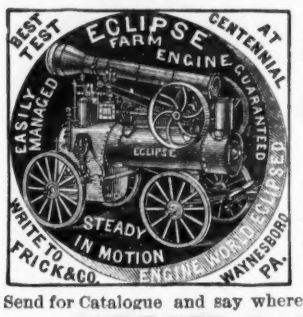

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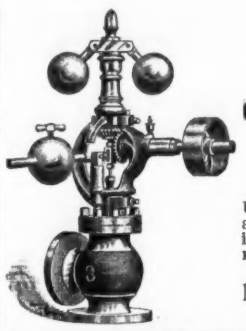

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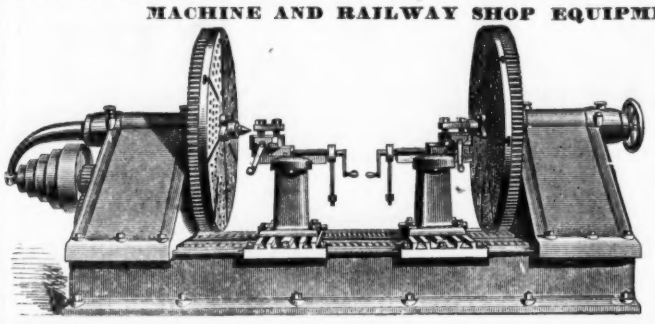

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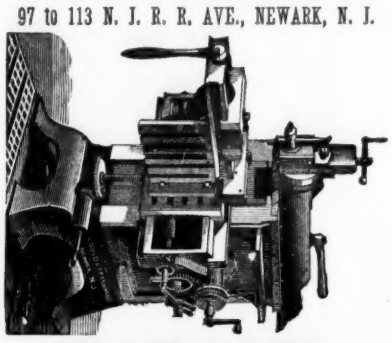

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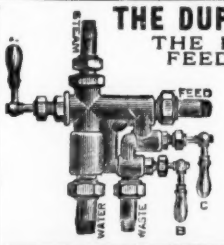

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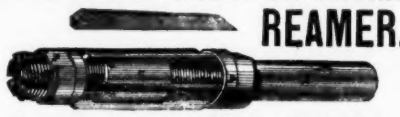

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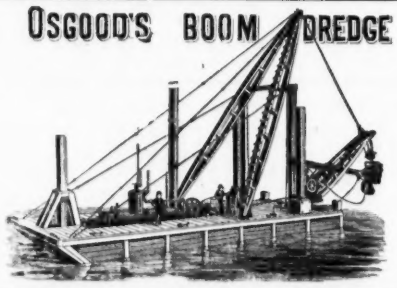

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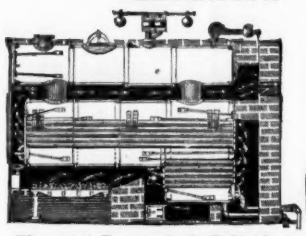

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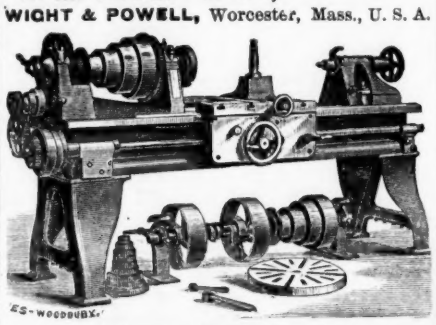

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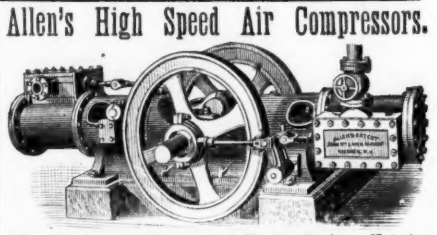

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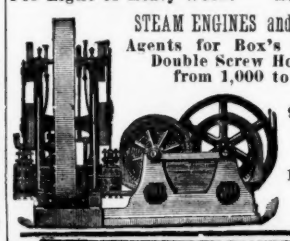

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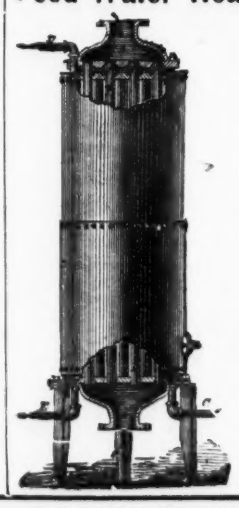

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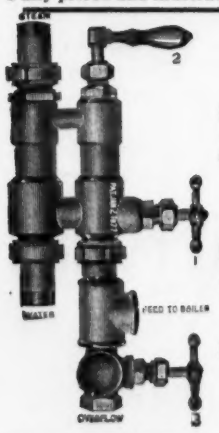

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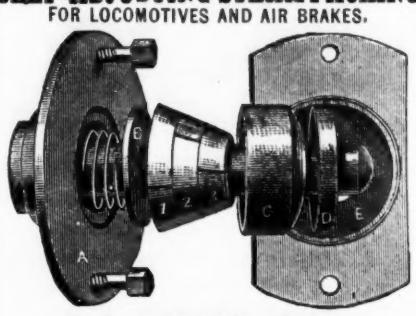

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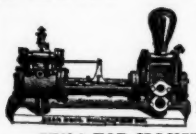

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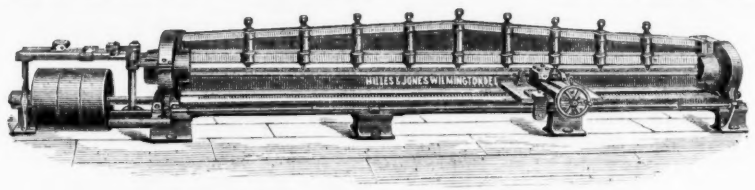

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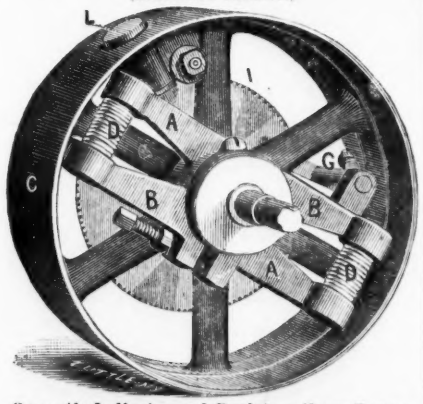

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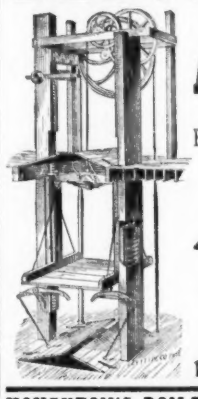

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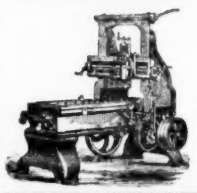

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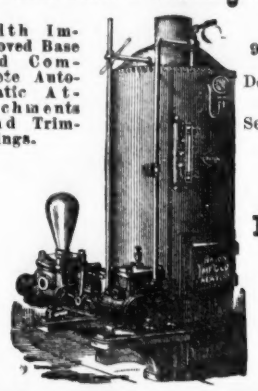

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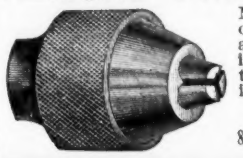

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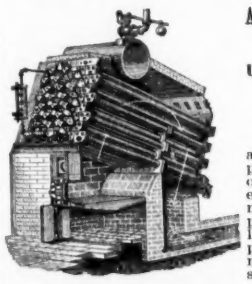

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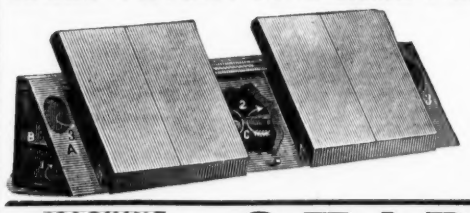

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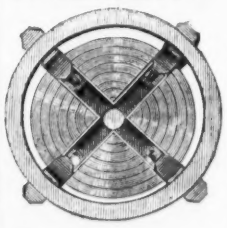

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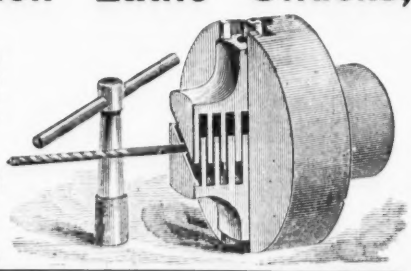

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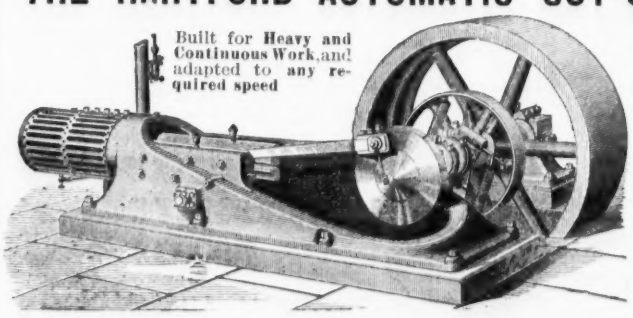

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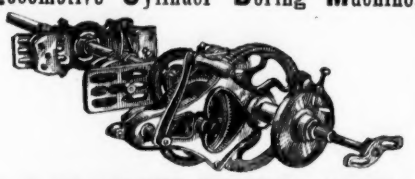

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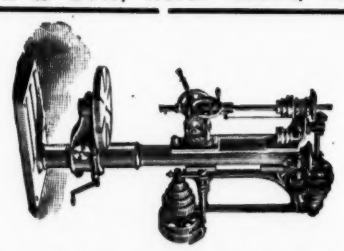

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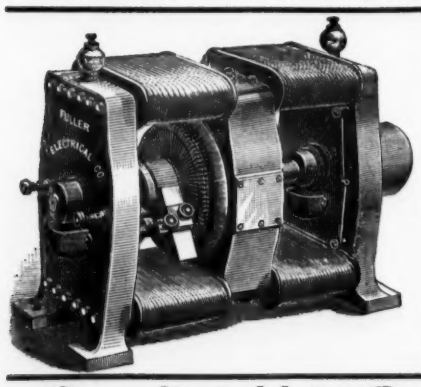

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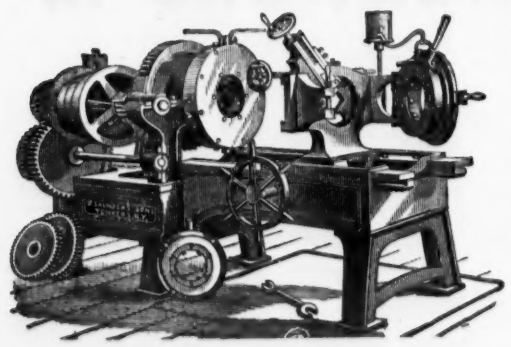

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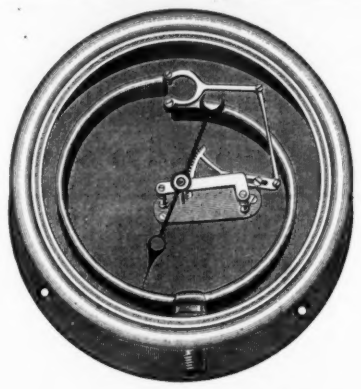

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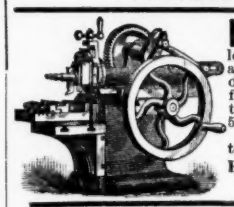

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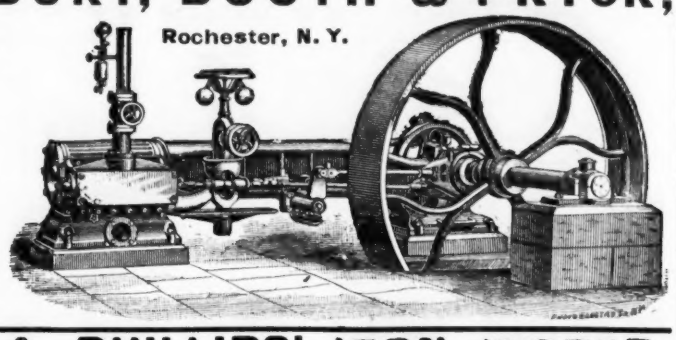

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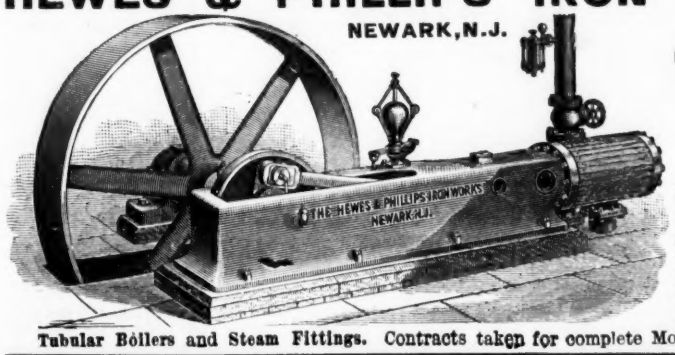

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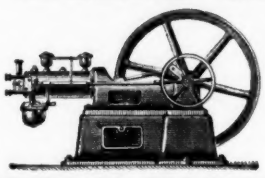
NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.

Started Instantly by a Match, it gives full power immediately.

When Stopped, all Expense Ceases.

No explosions; No Fires nor Cinders; No Gauges; No Pumps; No Engineer or other attendant while running.



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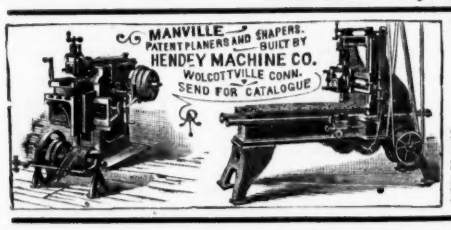

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Manville Patent Iron Planers and Shapers.

15 in. Shapers, 24 in. Shapers, 3½ ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 8 ft. x 24 in. Planers, Amateurs' Hand Planers, with chuck and centers, Hollow Steel Spindle Hand Lathes, Brass and Wire Slitters, Spring Chuck, and Common Clock Lathes. Catalogue gives many names of users of our tools.

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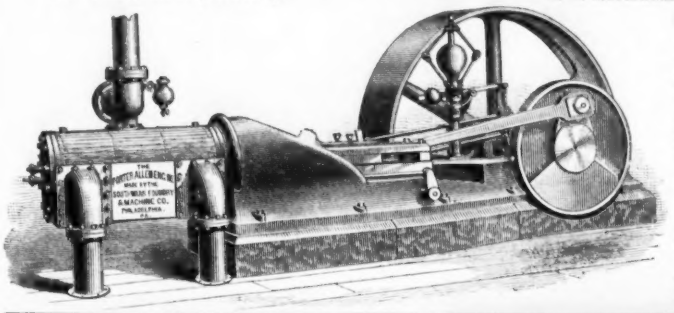

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Orders solicited for Iron and Brass Castings in the rough.

Address the Company, 430 Washington Avenue, Phila., Pa.

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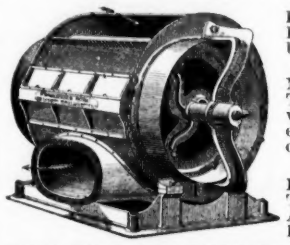

HAS NO EQUAL FOR A PRESSURE BLAST.

GIVES A DEFINITE QUANTITY OF AIR without reference to condition of Cupola.

SPEED AND POWER **LESS** THAN FOR ANY OTHER BLOWER.

WILL GIVE ANY REQUIRED PRESSURE

AT 50 to 100 REVOLUTIONS PER MINUTE.

SEND FOR PRICES.

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THE ALLIGATOR WRENCH,

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Teeth cut diagonally. Grips Round Iron or Pipe.

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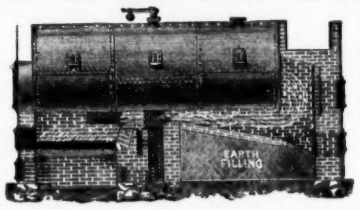

Economy of Fuel, with increased capacity of steam power. The same principle as the SIEMENS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire. Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c. **A. F. UPTON, General Agent,**

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Second-Hand & New MACHINERY.

MARCH 1, 1882.

One Car Axle Lathe. Hewes & Phillips. New.
One Engine Lathe, 36 in. x 15¼ ft. A1 order.
One " " 28 in. x 16 ft. Fifield. New.
One " " 28 in. x 12 ft. " "
One " " 27 in. x 17 ft. B'lyn S. E. Works.
One " " 24 in. x 12 ft. Fifield. New.
One " " 24 in. x 10 ft. " "
One " " 24 in. x 10 ft. New Haven.
One " " 20 in. x 14 ft. Fifield. New.
One " " 20 in. x 12 ft. Ames. New.
One " " 20 in. x 10 ft. " "
One " " 20 in. x 8 ft. " New.
One " " 18 in. x 9 ft. Whitc'b. Good order.
Three Engine Lathes 18 in. x 8 ft. Jones & Lamson New.
One Engine Lathe, 16 in. x 6-7-8 ft. Bridgeport Mch. Tool Works. New.
Six Engine Lathes, 16 in. x 6 ft.-7ft. x 8 ft. Ames. New.
One " " 15 in. x 6 ft. Flather's. New.
Three " " 14 in. x 6 ft. Star Tool Co. New.
One " " 14 in. x 6 ft. Hand. New.
One " " 13 in. x 6 ft. Ames. New.
One " " 13 ft. x 4½ ft.
One " " 12 in. x 6 ft. Lincoln.
Two " " 11 in. x 5 ft.
One Hand Lathe. 12 in. x 5 ft.. Hendey. New.
One " " 7 in. x 2½ ft. NewSpencer.
One Planer 18 in. x 3½ ft. Good order.
One " 20 in. x 16 x 4 ft.
One " 24 in. x 7 ft. New Haven. Good order.
One 6 in. Stroke Shaper. Boynton. New.
One 15 in. Stroke Shaper. Hendey. New.
One 15 inch Stroke Shaper. Gould & Eberhardt. New.
One 20 in. Stroke Shaper. G. & E. New.
One 24 in. Stroke Shaper. Hendey. New.
One Screw Machine. New Pattern.
One 20 in. Upright Drill. Prentiss. New.
One 24 in. " " Ames. New.
One 30 in. " " Prentiss. New.
One 38 in. " " New Haven. New
One Suspension Drill. Kidd. Good order.
Three Sensitive Drills.
25 Lincoln Millers and Vises. Good order.
One No. 3 Garvin Hand Miller. New.
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One 250 lb. Steam Hammer. Ferris & Miles.
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Large Iron Planer for Sale.

Full capacity of Planer, 26 ft. long; 4 ft. wide; 3 ft. high. For particulars address,

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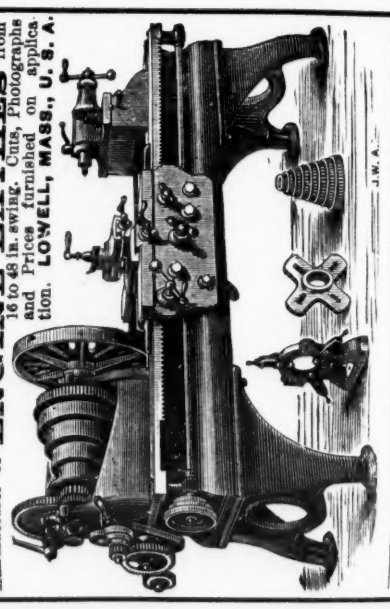

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13 in. swing, 6 ft. bed. Ames.
14 " " 6 " " Johnson.
15 " " 6 " " Lathe & Morse.
16 " " 6 " " Nutter, Barnes & Co.
16 " " 6 " " Ames.
18 " " 8 " " Blaisdell.
18 " " 10 " " "
21 " " 8 " " "
21 " " 10 " " "
22 " " 23 " " Pond.
22 " " 25 " " "
24 " " 10 " " Blaisdell.
24 " " 12 " " "
26 " " 26 " " Powell.
36 in. swing, 16 ft. bed. Fitchburg.
36 " " 18 " " "

IRON PLANERS.

16 in. x 16 in. x 3½ ft. Parker.
20 in. x 20 in. x 5 ft. Hendey.
22 in. x 20 in. x 4 ft. Pond.
22 in. x 22 in. x 4 ft. Powell.
24 in. x 24 in. x 6 ft. Woodman.
26 in. x 24 in. x 6 ft. Wheeler.
26 in. x 24 in. x 8 ft. Gleason.
27 in. x 27 in. x 7 ft. Whitcomb.
30 in. x 30 in. x 10 ft. Fitchburg.
32 in. x 32 in. x 8 ft. Gleason.
32 in. x 32 in. x 10 ft. "

SECOND-HAND and NEW MACHINERY

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The following New and Improved Machinists Tools are part of what we have for early delivery.

1 36 in. x 36 in. x 9 ft. Iron Planer. 2d-hand. March.
2 30 in. x 30 in. x 8 ft. Planers. New. March.
2 26 in. x 26 in. x 6 ft. " " "
2 30 in. swing, 15 ft. bed. Engine Lathes. March.
1 22 in. swing, 13½ ft. Bed Engine Lathes. "
3 18 in. " 10 ft. " " "
3 18 in. " 8 ft. " " "
4 11 in. " 5 ft. " " "
2 30 in. " Upright Back Geared Drills. "
2 9 in. Shapers. New. March.

The following on hand;

1 22 in. swing, 12 ft, Bed Engine Lathe. New.
1 19 in. " 6 ft, " " 2d-hand.
2 19 in. " 10 ft. " " New.
2 19 in. " 8 ft. " " "
1 18 in. " 8 ft. " " "
1 15 in. " 5 ft. " " "
1 17 in. " 6 ft. " " 2d-hand.
1 17 in. " 7½ ft. " " "
1 15 in. " 15 ft. " " "
1 1¾ in. " 4 ft. " " "
1 15 in. " 9 ft. Hand Lathe. New.
1 12 in. " 6 ft. Bed Hand Lathe. New.
1 10 in. " 4½ ft. " " "
1 Boring Lathe, 16 ft. bed. 42 in. swing.
1 Round Arbor Fox Lathe. Fine order.
1 Iron Planer, 37 in. 36 in. x 9 ft. 2d-hand.
1 48 in. Gear Cutter. New.
2 48 in. Swing Radial Drills. New.
1 38 in. Swing Upright Drill. B. G. & S. F. New.
1 20 in. Upright Drill. Back Gear. New.
1 21 in. Upright Drill. Nearly New.
1 18 in. Bench Drill.
2 Wall Drills, heavy. Second-hand. 60 and 72 in
1 3 Spindle Drill. New.
1 6 in. Shaper. New. Hand or Power.
2 Milling Machines, Lincoln pattern. Second-hand
2 Manhattar Arms Co, Millers. Second-hand.
1 Sellers Milling Machine. 2d-hand.
1 Face Milling Machine. Second-hand.
1 Pond's Double Milling Machine. 2d-hand.
1 No. 2 Screw Machine. New. Turret Head.
1 Screw Head Slotter. Second-hand.
3 Second-hand Profiling Machines.
1 Vertical Centering Machine. Nearly new.
3 4½ in Hyde's Patent Centering Machines. New.
1 Emery Grinder, 2d-hand. Small.
1 Sellers' Tool Grinder. "
1 Pipe Cutting Machine. Second Hand. 2 in.
1 1¼ in. Wood & Light Bolt Cutter. New.
1 Wells Bros. 1½ in. Bolt Cutter. New.
1 Bolt Pointing Machine. Second-hand.
1 Double Nut Tapper. New.
1 Horizontal Boring Machine, Small. 2d-hand.
1 Betts, No. 2, Power Punch. New.
4 Double-Acting Presses, No. 3, nearly new.
4 Single-Acting Presses, for power, "
100 Foot Presses, nearly new.
1 Medium Power Punching Press. Second-hand.
2 Small " " Presses. "
1 Foot Punch, with bench. New.
1 Lot Pistol Machinery. Second-hand.
1 Grind Stone and Frame.
1 Crane. Second-hand. 20 ft. jib. 6 Tons.
1 4 Side Moulding Machine. New. 8 in.
Lot of Forges, 1 Jig Saw, 1 Double Saw Bench, 1 Band Saw, 1 Slat Tenoner, 1 Railway Saw Bench, 1 Foot-power Circular Saw.
Cold Rolled Shafting, Palleys, Hangers, Couplings, &c., always in store.

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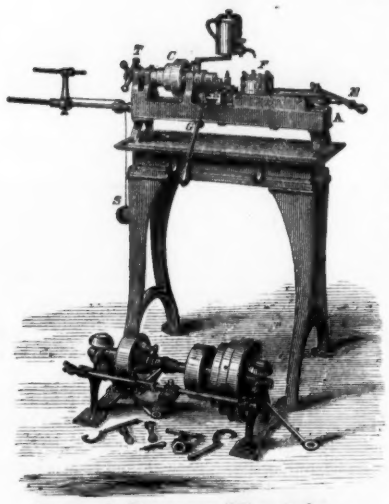


No. 4 Screw Machine.

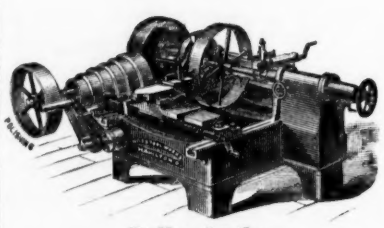
The No. 4 Screw Machine is of the same general construction as the one previously described, but much lighter and especially intended for making the smaller screws that are used by sewing machine manufacturers, gun-smiths and clock-makers. The spindle has a hole bored through it seven-sixteenths of an inch in diameter, and is provided with a patent device for opening and closing the jaws in the chuck, which holds the wire from which the screws are made.

This operation of opening and closing the jaws of the chuck is performed in an instant without stopping the machine, and effects a great saving of time in making small screws. The revolving head is made entirely of steel.

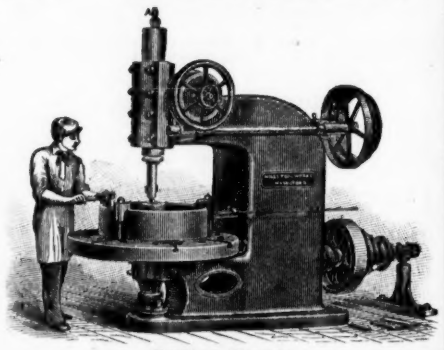
Size of hole through spindle, 7-16 inch; size of holes in revolving head, 9-16 inch; length that can be milled, 2½ inches. Friction Pulleys on counter-shaft are 7½ inches diameter and 2½ inches wide. Counter-shaft should run 260 turns per minute. Weight of machine prepared for shipment, about 500 lbs.

SPECIAL PULLEY MACHINERY.

36 in., 50 in. and 60 in. Swing.



Pulley Lathe.



Pulley Borer.

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Cram Bros. Manuf. Co., Chicago, Ills.; E. P. Allis & Co., Milwaukee, Wis.; Buckeye Engine Co., Salem, Ohio; Geiser Manufg. Co., Waynesboro, Pa.; Frick & Co., Waynesboro, Pa.; Pray Manufg. Co., Minneapolis, Minn.; North Star Iron Works, Minneapolis, Minn.; Grainger & Co., Louisville, Ky.; Blymyer Mfg. Co., Cincinnati, O.; Simpson & Gault, Cincinnati, O.; Poole & Hunt, Baltimore, Md.; Jones & Laughlins, Pittsburgh, Pa.; Sinker, Davis & Co., Indianapolis, Ind. M. C. Bullock, Chicago, Ills.; W. McGregor & Co., Chicago, Ills.

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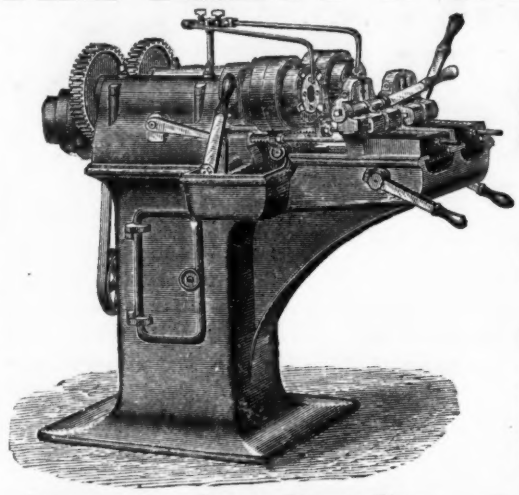

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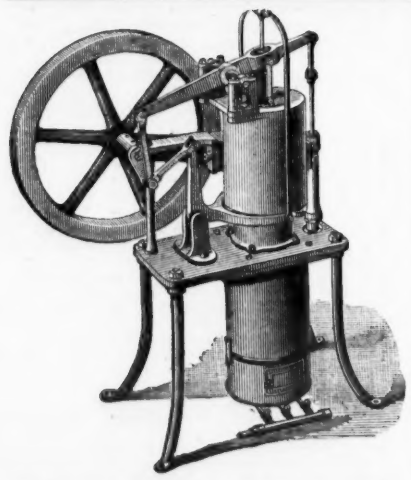

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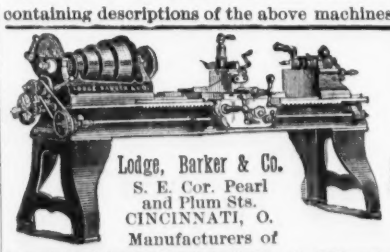

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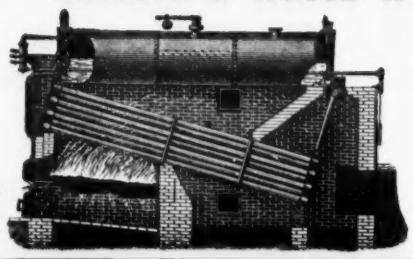

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